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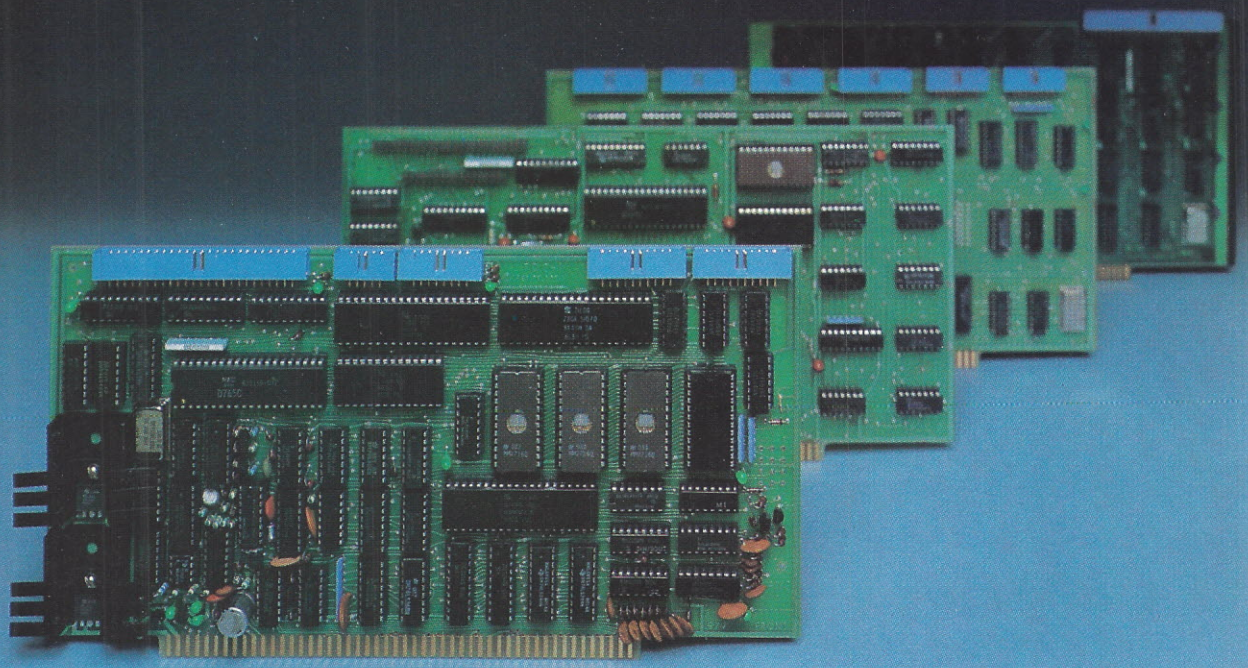

TELETEK's memory board rounds out our family of high-technology IEEE S-100 boards by offering the highest performance to cost ratio in the industry. They're powerful, usable, and they fit-together and in your system.

*TELETEK's new 64K bank-select dynamic memory board is field-expandable to 256K! Capable of operation at 4MHz and (optionally) at 6MHz, it is already getting rave reviews from users. Jumper plugs allow operation with a wide range of 8080, Z80, 8085 or Alpha Micro processors.

FDC-I: Still the most powerful IEEE-S100 board on the market. Z80A CPU, single- or double-density floppy-disk controller, two serial and two parallel ports, 8k of memory, timer, a 2716 burner, etc., all on one board! Based around the powerful Z80A family and the exceptional NEC765 (or Intel 8272) controller chip, this unit is a microcomputer on one board! CP/M®, MP/M®, Oasis®, Infosoft® compatible.

PSIO: A two-parallel, four serial port board designed around the Z80A family, using its powerful vectored interrupt structure. The board is designed for use in multi-user systems and is currently running with the FDC-I and MP/M®. As many as 14 PSIOs may be daisy-chained in one system under interrupt control.

FDC-II: A powerful single- or double-density FDC capable of controlling as many as eight drives simultaneously. The FDC-II has an on-board data buffer which allows operation independent of the CPU—no particular CPU speed nor continuous CPU overhead are required when transferring data to or from the floppy disk drive.

I²: Teletek's Intelligent Interface is capable of simultaneously interfacing several parallel devices, including intelligent hard disks, to the S-100 bus. Its own on-board Z80A CPU (optionally Z80B, 6MHz) runs independently of the system CPU and takes no system memory space. On-board buffer space, DMA I/O transfer, more.

What else do we offer? How about the strongest support in the industry (check our documentation—it's been called the best anywhere). We're dedicated to getting your system up and running properly.

But isn't that what you'd expect from a company that's been around for 13 years?

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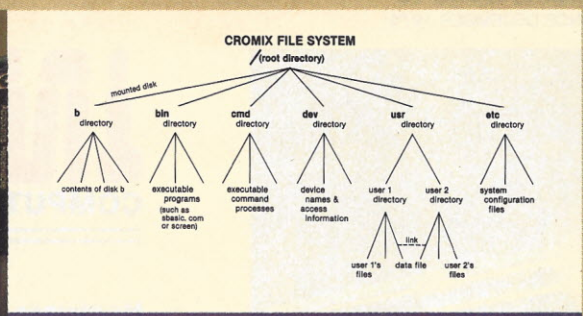

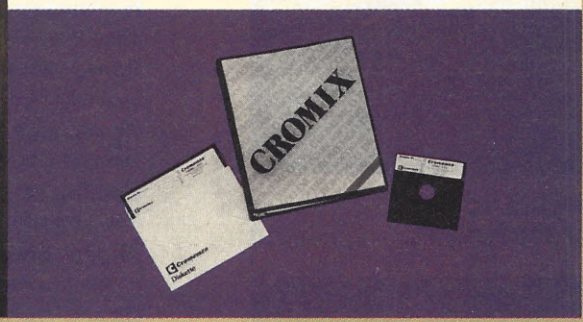

CROMIX*— Cromemco's outstanding UNIX†–like operating system

CROMIX is just the kind of major development you've come to expect from Cromemco. After all, we're already well-known for the most respected software in the microcomputer field.

And now we've come up with the industry's first UNIX-lookalike for microcomputers. It's a tried and proven operating system. It's available on both 5" and 8" diskettes for Cromemco systems with 128K or more of memory.

Here are just some of the features you get in this powerful Cromemco system:

- Multi-user and multi-tasking capability
- Hierarchical directories
- Completely compatible file, device, and interprocess I/O
- Extensive subsystem support

FILE SYSTEM

One of the important features of our CROMIX is its file system comprised of hierarchical directories. It's a tree structure of three types of files: data files, directories, and device files. File, device, and interprocess I/O are compatible among these file types (input and output may be redirected interchangeably from and to any source or destination).

The tree structure allows different directories to be maintained for different users or functions with no chance of conflict.

PROTECTED FILES

Because of the hierarchical structure of the file system, CROMIX maintains separate ownership of every file and directory. All files can thus be protected from access by other users of the system. In fact, each file is protected by **four separate access privileges** in each of the three user categories.

TREMENDOUS ADDRESS SPACE, FAST ACCESS

The flexible file system and generalized disk structure of CROMIX give a disk address space in excess of one gigabyte per volume — file size is limited only by available disk capacity.

Speed of access to disk files has also been optimized. Average access speeds far surpass any yet implemented on microcomputers.

'C' COMPILER AVAILABLE, TOO

Cromemco offers a wide range of languages that operate under CROMIX. These include a high-level command process language and extensive subsystem support such as COBOL, FORTRAN IV, RATFOR, LISP, and 32K and 16K BASICs.

There is even our highly-acclaimed 'C' compiler which allows a programmer fingertip access to CROMIX system calls.

THE STANDARD O-S FOR THE FUTURE

The power and breadth of its features make CROMIX the standard for the next generation of microcomputer operating systems.

And yet it is available for a surprisingly low $595.

The thing to do is to get all this capability working for you now. Get in touch with your Cromemco rep today.

*CROMIX is a trademark of Cromemco, Inc.
†UNIX is a trademark of Bell Telephone Laboratories

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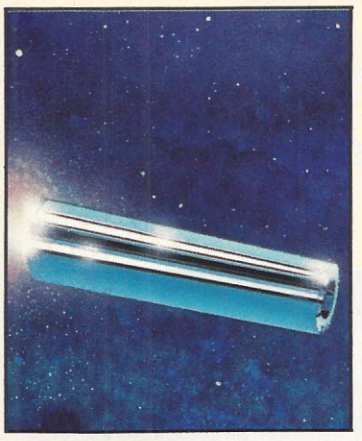
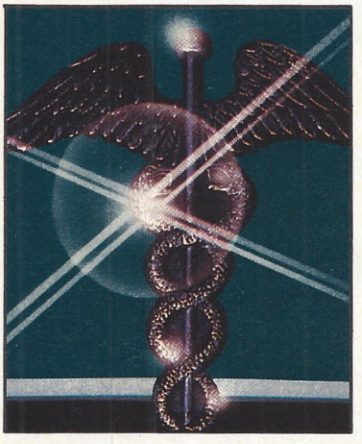


Linking up for the Future 68



Micros and the Future of Medicine 72

User-Friendly Languages 78

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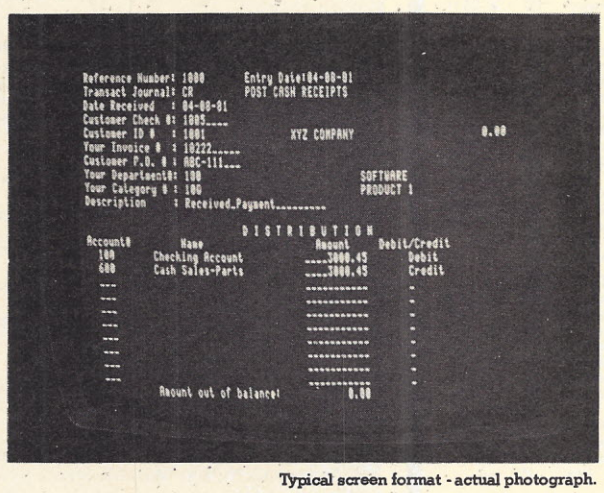
Introducing The Boss:™ the most advanced, yet most understandable, financial accounting system. Designed to automate your bookkeeping without confusion or mistakes.



Typical screen format - actual photograph.

If "fear of the unknown" is standing between you and computerization, you should find out about The Boss.

The Boss system is immediately comprehensible to bookkeepers because it utilizes virtually the same format they're used to.

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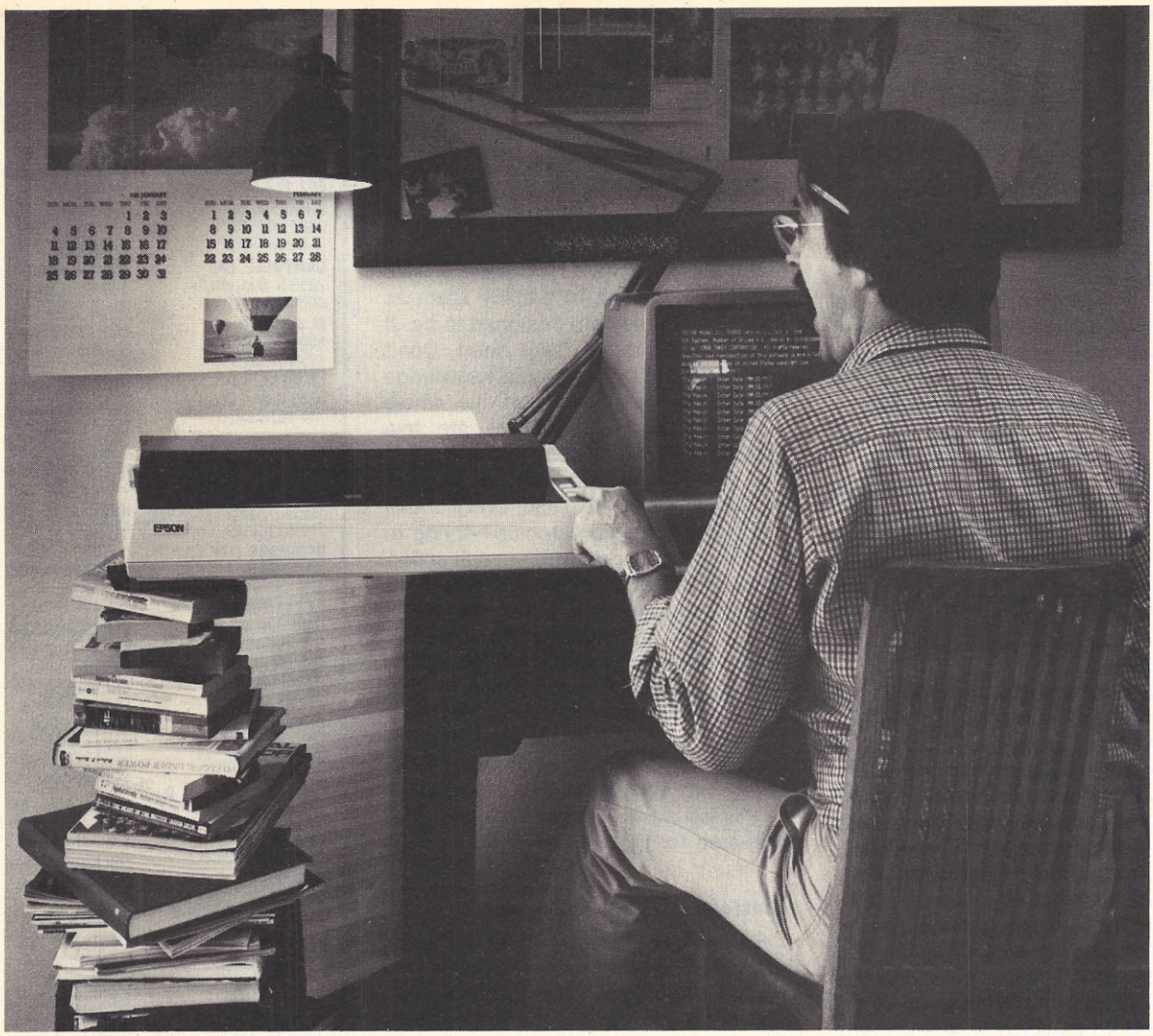


The MX-100. Not just better. Bigger.

Epson.

Our MX-80 was a pretty tough act to follow. I mean, how do you top the best-selling printer in the world?

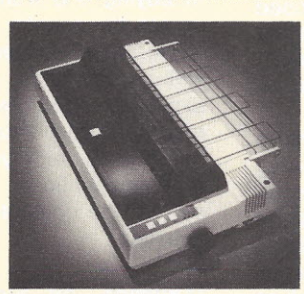
Frankly, it wasn't easy. But the results of all our sleepless nights will knock your socks off.

The MX-100 is a printer that must be seen to be believed. For starters, we built in unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability. Then we added the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see. Finally, we topped it all off with *both* a satin-smooth friction feed platen *and* fully adjustable, removable tractors. And the list of standard features goes on and on and on.

Needless to say, the specs on this machine — and especially at under $1000 — are practically unbelievable. But there's something about the MX-100 that goes far beyond just the specs; something about the way it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

All in all, the MX-100 is the most remarkable printer we've ever built. Which creates rather a large problem for those of us at Epson.

How are we going to top this?



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EDITOR'S NOTEBOOK

Cushioning the future shock

Alex sucked an icecube, faintly flavorful, all that was left. "Okay. You say that these are worlds."

"Right." From near the base of the console Uncle Bob picked up what looked like a small wand, with an insulated wire attached to it at one end. With the wand's free end he pointed at one of the screen's green circles, which in obedience to this wizard's gesture at once swelled up to dominate the screen. Inside the circle appeared a neat set of letters and numbers, in assorted colors. FACTORIES was one heading; POPULATION another. RMS, whatever that might be, stood at 46.

"Just a little micro, huh?"

*"Well, I have it fixed up with a few peripherals."**

Thus begins *Octagon*, a novel about the near future, featuring our friends, the computers, as one of its principal characters. Because it is an adventure tale, most of the processors are portrayed as less than savory citizens—one affectionately nicknamed "Berserker."

It's a story about a computer game run amok, about the influence giant computer networks can have on the lives of the unsuspecting innocent. It's significant that a TRS-80 and an Apple II share the glory of unravelling the whole mess, thus emerging as warrior heroes in an epic battle against a phalanx of interlocked Crays and IBMs.

Science fiction is largely about fantastic technological creations and their influence on people's lives. What strikes us as remarkable about this story is that today's ubiquitous microcomputer is given the same breathless, wondering treatment previously reserved for ultra-lightspeed starships and time machines. Whereas the latter contrivances are regarded as impossible to build, micros clearly are not.

Computers — particularly microcomputers—have literally surrounded us in these modern times, both physically and in their influence on our work and our play. We would not be surprised to hear that *Octagon* itself was composed on a microcomputer, typeset with the help of a processor, and inked under the watchful eye of a computerized printing press.

But computers are fantastic machines nonetheless. We work with them every day of our lives, and have to stop sometimes and shake our heads in wonder at the whole idea. How a myriad of invisible electrons (or holes, depending upon your schooling), chasing themselves around the intricate topography of microscopically photo-etched silicon chips, can somehow orchestrate a flawless General Ledger Aged Trial Balance, time and time again, remains in the realm of fantasy for most of us.

But computers are here and the wise among us choose to employ them as the servants they are designed to be. If you're a newcomer, take heart. Don't be intimidated by the special knowledge needed to make sense of the whole computer movement. There are few experts in computerdom, and those that are, rarely admit to the charge. We are all latecomers to the game, every one of us playing a frantic catch-up—trying to surround the rascals with enough understanding so that they don't overwhelm us.

With this issue, our last for 1981, we attempt to cushion the blow of tomorrow's future shock. We do this by looking forward and speculating a bit on the microcomputer products the next few years will bring to us. Not all of our predictions will occur, but a lot of them surely will. When they do, the readers of this issue will perhaps be a bit better prepared for them than most.

Platform for the consumer

Earlier this year, we found ourselves unwittingly embroiled in the midst of a controversy involving computer stores vs. mail-order suppliers of similar products. The experience sensitized us to the very real problem of after-the-sale service to computer purchasers. Customer "hand holding" is a critical need for first-time computer purchasers, and is at least as important for "old hand" shoppers as it is in non-computer industries.

We'd like to get a little closer to what is *really* happening on this subject, and hope you will help us. Can you tell us about your own experiences in buying a computer? Was post-sale assistance needed? If so, was it available? On a scale of one to ten, how would you rate your dealer and/or catalog store? We'd like to get enough data to see just what the differences are in purchasing a computer across a counter, as opposed to buying one from a post office box across the country.

We are interested in good stories as well as bad ones; even an "ordinary" experience may disclose a trend. If the response is significant, we plan to share the results with you, along with our recommendations on how to best survive the computer sales jungle. Will you help?

—TF

*Octagon, *by Fred Saberhagen, is published by Ace Books, New York, NY. Reprinted by permission.*

Continued on page 11

WHAT'S THE KEY TO BUYING A COMPUTER?

Look beyond the computer. Look at how the total system– hardware, software, support, service– meets your needs, today and tomorrow. That's the key. When you choose a computer source, you choose a long term partner who must stand by you with total support. And no one stands by you like Heath/Zenith.

Software

Including word processing, business applications, versatile utility programs, and the Heath Users' Group library of over 500 low-cost programs for home, work or play.

And a choice of three operating systems, including CP/M by Digital Research for compatibility with thousands of popular CP/M programs.

Languages

For your own custom programs, Microsoft languages are available in BASIC (compiler and interpreter), FORTRAN and COBOL.

Self-Study Courses

Learn at your own pace with *Programming Courses* that teach you to write and run your own programs in Assembly, BASIC, Pascal or COBOL.

For the business person, *Computer Concepts for Small Business* helps you evaluate the ways a computer can benefit your business. And for the novice, *Personal Computing* is a complete introduction to computer fundamentals and BASIC Programming.

Support

Before and after the sale we work with you to configure the system that serves you best. We help you get your system up and running smoothly. Assistance is always just a phone call away.

Service

Friendly, experienced technicians are available, either over the phone or at any of the 56 Heathkit Electronic Centers nationwide.

Visit your Heathkit Electronic Center*

Pick the store nearest you from the list at left. And stop in today for a demonstration of how Heath/Zenith Computer Systems can serve you. If you can't get to a store, send $1.00 for the latest Heathkit Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write to Heath Co., Dept. 343-844, Benton Harbor, MI 49022.

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Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

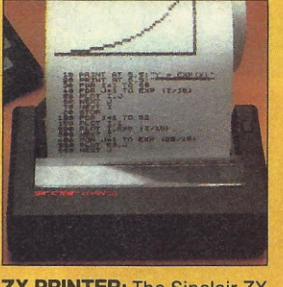
With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Warranty and Service Program**

The Sinclair ZX81 is covered by a 10-day money-back guarantee and a limited 90-day warranty that includes free parts and labor through our national service-by-mail facilities.

**Does not apply to ZX81 kits.

NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.

ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

The $99.95 personal computer.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95.* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

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These numbers are for orders only. For information, you must write to Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

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Smartmodem also includes several switch-selectable features that let you tailor performance to your exact needs. You can "set it and forget it" for the ultimate in convenience.

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Smartmodem, Smart Buy. Professional quality features. Versatile performance. A full two-year limited warranty. A suggested retail price of only $279.

What more could you want? Perhaps the matching Hayes Stack Chronograph, an RS-232C compatible calendar/clock system.

Check out the Smartmodem wherever fine computer products are sold. And don't settle for anything less than Hayes.

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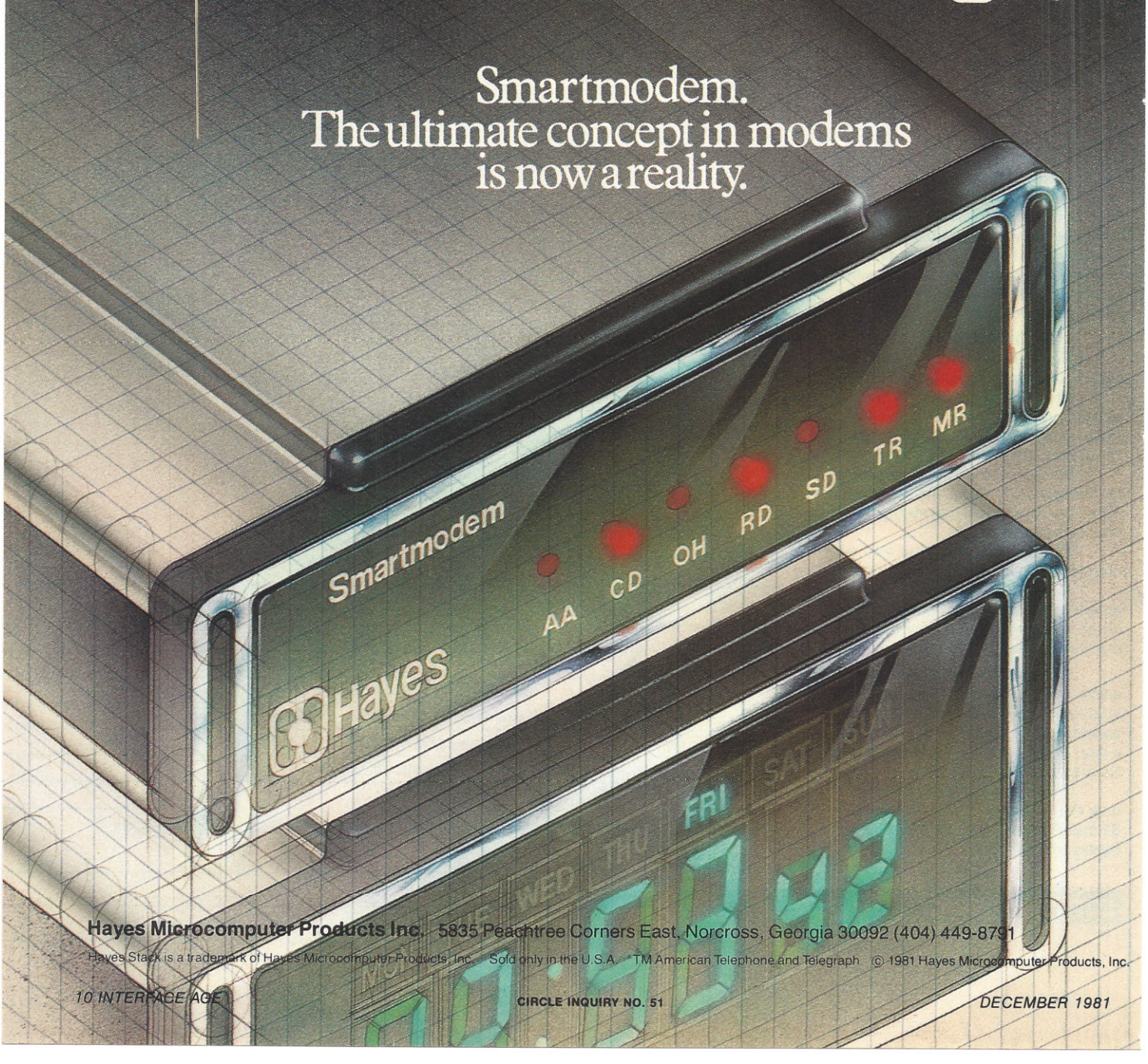

Hayes Microcomputer Products Inc. 5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8791

Preview of '82

During the coming year, we are planning a number of special projects that will provide valuable advice for the end user, offering him guidelines on product selection. We will present tips on how to cope with the most oft-repeated complaint to be heard in the industry—lack of after-sale support. The overall editorial thrust, more than ever before, will reflect concern for the consumer's best interests.

First and foremost, we are stepping up our well-received product comparison and benchmark reports. Both the scope and number of our manufacturer surveys will be escalated. The result will be more and better comparison charts that detail product specifications, so that the consumer can choose the package best suited to his particular needs.

The surveys lead off next month with our annual new year's comparison of the latest business systems models, highlighting some of the most popular micro systems in the field. In subsequent months, we will take a look at systems in various price and capability catagories —those suitable for both home and business use; low-cost business systems; and higher capability business models. Each survey will narrow the field down to a strict set of guidelines, so that we can offer the widest possible range of micro products throughout the year.

The surveys are supplemented by more in-depth articles that evaluate a specific hardware or software offering. Software reviews by Alan R. Miller, Carl Heintz and other contributors will continue; while Tom Fox, Terry Benson, Hillel Segal and Roger H. Edelson cover the hardware configurations. Monthly columns of specialized interest will continue: pocket computers, computer mathematics, educational applications and Roger C. Garrett's perennielly popular *Inventor's Sketchpad*.

Other consumer-oriented projects will include a special issue on end-user options: explaining the wheres, whys and hows in selecting a computer.

Some special personal-experience stories are planned, wherein users in various businesses detail how they implemented computers for their particular applications—the problems they encountered and how they solved them. The title of one upcoming article capsulizes this neatly: *The Agony and the Ecstacy of a New Computer Owner*.

All in all, it's a highly ambitious plan—one that we think will reward our readers with vital insight into a rapidly-growing industry that is profoundly improving our everyday routines. ***—LS***

LETTERS

More about sorts

Re: "About Sorts" by Gene Cotton (IA Aug and Sep 81), the articles are very good. There seems to be an error in the August issue on page 69 in the right column at the top of the page. Line 140 should read A(I – 1)⩽T, rather than A(I)⩽T.

T. Barker Dameron
Raleigh, NC

I decided to use your article as a learning vehicle. I'm impressed at how helpful it is in understanding sorting methods.

I would like to point out one correction in the August issue: on page 146, in the lower right hand listing, line 290 "GOTO" should read "GOTO 140".

Larry Ollivier
San Diego, CA

Consumer tale of woe

I thought some of your readers might benefit from my experience and save themselves $25 to boot. I have a TRS-80 model III and purchased Microsoft's Olympic Decathalon game from a dealer who was apparently not aware of the differences between the TRS-80 models I and III. In any case, the box was clearly marked TRS-80. The program would not load on my model III. After numerous tries and noting that the program would start to load and give a "please wait..." message, I gave up and contacted Microsoft, asking what was wrong and if I could exchange the program for a model III version. The consumer products representative told me that they couldn't exchange the program and that a model III version would not be available until (maybe) the first quarter of 1982. I would just have to purchase another copy for the model III when it was available. When I asked if there was anything I could do to patch and load the version I had, she transferred me to a technical representative, who was helpful and assured me that there was nothing I could do to patch or load the program, since it would not work on the model III. He seemed very sincere when he told me "I'm sorry, but there is nothing you can do to load it..." In effect, it was my problem.

I guess I threw away $25 on a program I can't use or even try out.

Paul Holliday
San Diego, CA

Other side of the coin

In response to a letter (IA Aug 81) calling for you to publish more applications programs, I strongly object to magazines publishing anything other than game programs. Publishers and magazines have no business passing themselves off as having expertise in applications programming. If you want to do your readers a service, confine yourself to reviews of new products, computer fiction and elemental things like flow-charting, sorting and searching techniques and basic logic. You have a better than average publication. Why mess it up?

Ronald C. Wagener
Virginia Beach, VA

Secrets of "m'

I enjoy your "Micro Mathematician" column and noted in the September issue that you offered no opinion as to why the denominator in variance calcution is "m" or "m – 1." I was not sure whether you really did not know or were just saying this for many of the nonstatisticians in your reading audience. Just in case you were unaware, let me tell you when "m" represents an "entire" population, for example, everyone in a room or the entire population of a city, then if a variable is enumerated on this population and the variance is taken, then the appropriate denominator is "m". However, if a random sample is taken from a population, the variance calculated on the random sample with an idea towards applying this variance to the general population as a whole, the appropriate denominator is "m – 1". This has to do with the fact that if just "m" were used in this latter situation, it would produce what is called a "biased" estimate of the variance. It also has to do with old term of degrees of freedom that I am sure you know from its use in the calculation of the students t-test and other statistical calculations. Thus I believe this is a rather simple way of determining when to use the "m" and when to use the "m – 1" in the variance calculation.

Neal Koss, M.D.
Torrance, CA

In defense of Pet

Re: "System of the Month: Commodore CBM" (IA Jul 81), I found the article interesting, but there were a few items that should be cleared up. The outward appearance of the Commodore computers has changed very little since the first one. The computer/terminals have always been built as one unit. The only major change has been to drop the ⅔ size keyboard and the console tape unit. They also now offer an 80-character screen on the CBM models. Yes the Pet can speak, when trained to. One must

Daily Tribune

40 EDITION ★★★★ FORECAST: HOT

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add some to the hardware and write a special software routine. The 6522 VIA chip (Versatile Interface Adapter) produces a square wave output at pin PB7. With an appropriate TTL buffer, amplifier/speaker and software the Pet will bark on command. As for the IEEE-488 bus, it has been a standard feature of the Pets since 1977. When other companies were all hopping on the S-100 bus, Commodore stuck it out with the 488. This still presents problems in communicating with the outside world. But the 6522 VIA chip can be configured to supply RS-232C from one of its output ports, allowing the Pet to talk to any other RS-232C equipped system. After having owned a Pet for five years, I have found it to be a very versatile machine. No machine comes with everything on it. Having to learn how to use the Pet on one's own gives that operator a better edge over someone who only flips the power switch to on and plugs in prewritten software.

L.R. Hollis
China Lake, CA

For the record

I hasten to clarify a couple of points in Elliott MacLennan's otherwise excellent article ("Jurisprudent Computerist" IA Sep 81) regarding my presentation at the Computer Law Institute. First, the four essential elements of difference between the commercial DP marketplace and the consumer computer marketplace that I discussed are volume, breadth, plebeianism and *informality* (not "information" as reported).

Second, and much more important, let me point out that the FTC Act does not state that mail order solicitations of sales are *per se* unfair trade practices, subject to certain exceptions, as the language of your article suggests. Rather, the Act defines as an unfair trade practice the solicitation of mail order sales when the seller has no reasonable expectation at the time of solicitation that the goods can be shipped within 30 days or within some other length of time that is clearly stated in the solicitation. So long as the seller reasonably expects to be able to ship within the stated time, or within 30 days, solicitations of mail order sales are not in themselves unfair trade practices—and, of course, they continue to be an important factor in the consumer computer industry.

Paul Bent
Century Financial Services
Irvine, CA

Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

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BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

Complete information? It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us. Or, circle the reader service card number below.

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Version II employs two drives. This means larger on-line file capacity faster access to information and more flexible reporting capabilities. It also incorporates the Soundex data retrieval capability. *What's more, Version II supports the 80-column board, lower case and the Epson printer—to our knowledge, no one else does.* Version II is indeed great. At a great price. **$200.**

Super.

Version III is designed for the CORVUS hard disk, hence offers far more capacity and far faster access than diskette-based system. Version III also employs the Soundex system. Like Version II, it supports the 80-column board, lower case and the Epson printer. The price is also super. **$450.**

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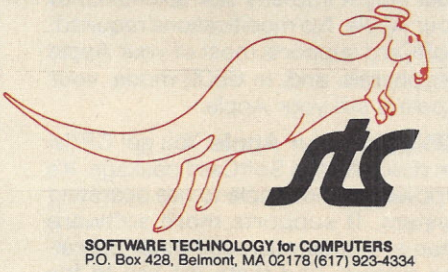

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CIRCLE INQUIRY NO. 124

LETTERS

Switch to Pascal?

The review of JRT Pascal by Alan R. Miller (IA May 81) made me wonder if I should switch from Fortran 80. I'm using the North Star Horizon II with 56K CP/M in a neurophysiology lab, and plan to apply it to A/D and D/A conversion, curve fitting, and small scale linear programming and iterative solutions to partial nonlinear differential equations. Which, if any version of Pascal would you suggest as best suited to these problems? Can any version be linked to routines developed in assembly language or Fortran? Is there one whose library of mathematical functions is as extensive as Fortran 80's? Is it possible and convenient to use North Star's floating point board to speed up execution of any particular version of Pascal? Or would extensive patches be required?

Ted Carnevale
Long Island, NY

Pascal, Basic and Fortran all exist because each fulfills a particular need. Furthermore, each of the several implementations of these languages may excel in a particular area. One version will be best for writing and debugging the user's programs. Another will more rapidly execute the program. A third version will provide more precision. If several thousand dollars are available, then three Basics (CBasic, Basic-80 and Bascom), three Pascals (Pascal/M, Pascal/MT + and JRT Pascal), and two Fortrans (Fortran-80 and SSS Fortran) would be ideal. On the other hand, if funds are limited, then perhaps Basic-80 and Pascal/M would do. All of these CP/M packages can link to assembly language routines. I do not have access to the floating-point board, but I suspect that it could not be readily used with the above programs. ***—ARM***

Call for more color

Just a note to say thank you for your fine magazine. Although the color computer is a very powerful machine, it is not very well supported. Your *Game Corner* column is an oasis in the desert. The Electronic Easel program (IA Aug 81) is a real gem. Keep up the good work.

Rick Etchells
Houston, TX

Little brother is watching

Angry with you and your magazine? That's an understatement! We, along with hundreds of other computerists traveled to New York and Philadelphia, to attend the National Small Computer Show (26-29 August) and the Personal Computer Arts Festival (28-30 August), both touted in your August issue Calendar. We expected to see thousands milling about interesting displays, vendors harking the latest and greatest in hardware and software. Instead, there was nothing—no show, no apologies.

We called the "promoters" of the New York show at the Englewood, NJ phone number listed in your Calendar, and were told how the original entrepreneurs had "sold the show" to the Little brothers, whoever they are—and that they subsequently failed to promote the event. We still don't know what happened in Philadelphia since those promoters prefer the anonymity of a post office box number.

I understand you sell advertising in advance. I also understand it is difficult to verify the authenticity of every advertiser or promoter that asks for space. But—when people drive 1,000 miles round trip and spend several hundred dollars for hotel accommodations, food, gasoline, toll roads, parking fees and use up vacation time in the process—it would appear you ought to do more than a casual, perhaps indifferent checkup on those you "promote" in your magazine.

As for the Little brothers, it would be appreciated if you include their names as promoters in any future announcements you make regarding computer shows. This way we and hundreds of other computer enthusiasts can stay home, safe in the knowledge we are not about to undertake another major trip for nothing.

Okay, now let's hear your side and your perspective. What do you intend to do, to preclude future occurrences such as this?

Peter and Susan Ness
Hampton, VA

Calendar items are neither "touted," "advertised," nor "promoted." They are simply reported on the basis of information supplied by the individuals sponsoring the events. We are not responsible for changes or cancellations that occur after our editorial deadline.

Apple reassessment

I found some errors and (in my opinion) less than comprehensive statements in Hillel Segal's "Assignment: Benchmark" (IA Oct 81) on the Apple II.

The Apple II or II Plus will handle these maximum numer of standard Apple Disk II drives: a) DOS 3.3 (using all slots) → 14 drives; b) Language System (Pascal, etc.) → 6 drives; c) CP/M System (Z80 card) → 6 drives. Deduct

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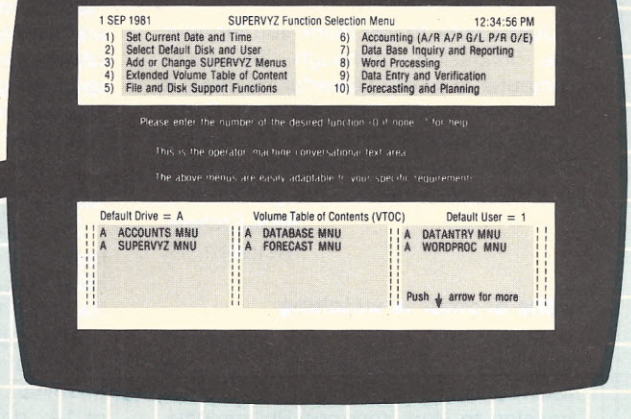

SEE US AT COMDEX BOOTH 1346

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CIRCLE INQUIRY NO. 45

two from these totals and you have the number of "floppy drives" that can be operated simultaneously with four 5-, 10- and/or 20-Mbyte Corvus Winchester-type drives, using unmodified disk operating systems.

Also the Z80 card is *not* a "frequently-added card" to my knowledge. In a system shared by two engineering departments, CP/M is about the only option not being utilized, though it is installed. Not to detract from CP/M and Z80 software, but is Segal aware of the Language System and its standard features compared to CP/M? That's why the Language System *is* a frequently-added option, preferred by programmers who have a choice.

Finally, it is misleading in this review, which is oriented toward business users, to include in its analysis the business-system opinions of apparent "novices on computers" who are still to "learn the ropes." I suspect when they do, these users will upgrade their Apples by adding such inexpensive niceties as an 80-column card, rather than buying "a more expensive system for business use later."

I have found the Apple II to be a rare exception in microcomputers. It can be purchased configured as a toy, yet "mature" enough (by plugging in the appropriate enhancements) to handle even massive data-base business applications.

Ben P. Baston
Houston, TX

Reader interface

I am seeking reading materials on the two basic types of CRT terminals, serial and memory-mapped.

John Silver
200 Cabrini Blvd. Apt 74
New York, NY 10033

I have a TRS-80 model I, level 2, with 48K and two disk drives. I also have Scripsit. I want to buy a good mailing list and data base program. Is there a mailing list program that blends with Scripsit? I do mass mailing and I'd like to be able to compose a letter and send it out to a list, personalizing it by merging at least the name-address with the text. Better yet, is there a mail list program that also allows a personalized header? I need a data base program with at least 40 fields, although I really would prefer unlimited fields. I'd also like one that can use Scripsit if possible. And I don't want to have to load and save all of the files just to read or change one.

William O'Neil III
806 Parma Ave.
Coral Gables, FL 33146

UPDATE

Will IBM take a bite out of Apple?

IBM's recent announcement of a personal desktop computer will influence two markets—small business computers in the $5,000-20,000 range and personal computers priced under $10,000, according to market studies by Venture Development Corp., Wellesley, MA. The research indicates that IBM has a 2.6% share of the worldwide personal computer market and 26.5% of the small business market in this range.

By placing its seal of approval on low end computers, IBM will spark growth in both markets. It will be some time, though, before IBM captures a significant share of the personal computer market. According to VDC, "IBM will have to strengthen its position with regard to distribution channels and applications software before Radio Shack and Apple will have anything to worry about."

The new entry will be sold through IBM's direct sales force, independent retail stores and IBM's retail stores. The direct sales force, which is geared to selling to large corporations, will have success in selling in quantities to these companies, but will fall short in reaching the over 5 million small businesses and 76 million households in the U.S., says the report. The company will have to set up a network of dealers and distributors to reach these potential customers. This will take time in order for IBM to insure that the quality of service and support is up to its standards. In addition, IBM may meet some resistance from customers, especially small businessmen, who want their system to be sold to them by IBM people. Both Apple and Radio Shack have elaborate channels of distribution that are established and working. This has taken several years to accomplish and IBM will have to do the same.

Businesses turn to used computers for equipment savings

With the cost of owning or leasing a computer rapidly escalating, more companies are turning to used computers according to *Purchasing World* magazine. Not only do used computers save 15-90% of the cost of a new system, but tax regulations provide a hefty investment tax credit.

Author Susan Vasquez notes that there is no standard price reduction on used computers, but at least a 20% saving on a MIPS (millions of instructions per second) rate is typical. Machines are rated according to this relative unit of power, making cost comparisons an easy task.

Other reasons for buying used computers include faster delivery, an opportunity to lease equipment with a higher-power model and the option to expand a current system to one with more peripherals or accessories.

As in any transaction between a used equipment seller and a customer, there are risks, warns Vasquez. In order to diminish the potential for being swindled or sold a machine you cannot use, the following recommendations are offered: contact a variety of dealers in the competitive used equipment market; be specific in your request for proposals (model numbers for all system components needed); ask a seller for references and check them; know exactly what services are to be supplied by the seller (delivery, installation, etc.); visit the seller to check the equipment and maintenance records; avoid used computers that need extensive refurbishing; and ask for commitments on a delivery date and a date when the computer will be ready for service.

Computer Game of the Year? Envelope, please...

Gamers from all over the U.S. recently selected the fantasy role-playing game, Temple of Apshai, as their favorite game.

Each year the Academy of Adventure Gaming Arts and Design, a group of hobby industry manufacturers, wholesalers and publishers sponsors the industry's Charles Roberts awards for excellence in game design. The Charles Roberts awards are named after the founder of Avalon Hill, one of the largest makers of war games. Charles Roberts is also recognized as the inventor of the modern board war game.

"What makes the award important," said Jon Freeman, Creative Director of Automated Simulations, Mountain View, CA, who produces the winning game, "is the fact that the academy opened a new category this year for computer games. In doing so, they have recognized the growing size and scope of entertainment software in general."

Electronic voice I/O market growing at enormous rate

Sales of speech synthesis equipment in the information processing and consumer business will grow from $23 million in 1981 to $495 million in 1985, says a recent report from Strategic Inc., San Jose, CA

Major driving forces in speech synthesis technology include the improvement

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Impressed?

Thanks to customers like these, DB MASTER is the second fastest selling business software package for the Apple II.

Even more impressive are the comments from some of our customers. As Mr. M. Robert McElwain, Senior VP of the Bank of Louisville states, "After having purchased more than 400 software packages, I'm still trying to establish a list of top ten that I wholeheartedly endorse. I don't have ten, but I'M ONE CLOSER—DB MASTER has been added to the list. It's a real treat to acquire those which are truly outstanding. DB MASTER is quality software which I highly recommend."

Equally impressive is the range of features built into DB MASTER. As Mr. McElwain continues, "I could comment on the screen formatting, short forms, security, auto date . . . but where do I stop? With over 100 Apples, we think we recognize good software when we use it."

Our special thanks to Mr. McElwain. And to all our equally impressed customers.

As they all know, in today's highly competitive marketplace, a good name is hard to come by.

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of algorithms for imitating human speech and the reduction of these algorithms to low-cost LSI packages, according to Strategic. Moreover, the company predicts that good quality speech will be possible on chips costing under $15 in large quantities.

Major applications for speech recognition and synthesis include hand-busy, eyes-busy applications, where it is necessary to get information from another source. Specific examples include electronic instruments that speak meter readings and respond to voice commands to change their front-panel settings.

Many applications already exist for speech synthesis, such as the choppy-sounding voice that informs the telephone caller that the number called has been changed and gives the new number.

Examples of future speech recognition applications cited by the report include managerial terminals that respond to voice commands, and programming of numerical-control machines and computers via voiced statements. Voice will be an excellent way to get around the manager's reluctance to type commands into a computer system, while voice data entry will make the programmer more efficient.

FCC Docket causing stir in industry

No specification in recent memory has caused as much concern to the electronics industry as FCC Docket 20780, because it affects all manufacturers of commercial and industrial electronic products, according to George R. Ufen of GRU Assoc., Placentia, CA.

Until now, there has not been such an all encompassing control over the EMI/RFI emanating from electronic equipment, except in the case of government suppliers and export goods. Those companies dealing with supplying the U.S. Government have had to comply with MIL-STD-461/62 since 1967. For export purposes, various companies have already had to design their products to meet the German VDE 0875, International CISPR and British Standard 727.

"Interference pollution" has spurred the FCC to action, says Ufen, and all manufacturers of domestic electronics will be held responsible for meeting the criteria of this new government docket. The date for compliance on newly designed equipment was Oct 1, 1981; for older equipment that will have to be brought up to date to meet compliance, the deadline is Oct 1, 1983.

FCC Docket 20780 is intentionally broad, so that it will cover any electronic device used for computations, control, operations, transformation, recording, filing, sorting, storage, retrieval and transfer. Examples of computing devices include, but are not limited to, business and personal computers, data processing equipment, digital weighing scales and switching power supplies.

Video computer system service network formed

Atari, Inc., Sunnyvale, CA, announced the formation of a nationwide independent service network to provide convenient warranty service for the Atari video computer system (VCS). The network, which will include 500 service locations by the end of 1981, will be composed of independent electronics retail and repair centers. Previously, all VCS service had been performed by Atari's regional service centers located in Somerset, NJ and Sunnyvale, CA.

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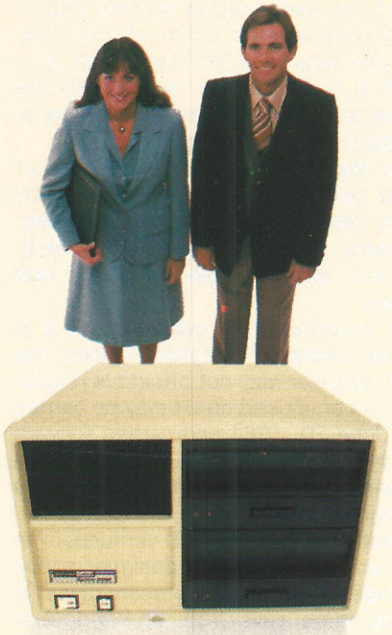
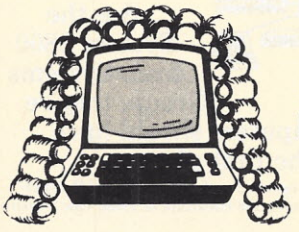


1981
Today's Requirements
Dual floppy single or multi-user system

1983
Tomorrow's Requirements
10M byte hard disk and floppy drive, single or multi-user system

1985
Your Future Requirements
40M byte hard disk and 20M byte tape back-up, single or multi-user system

Jurisprudent Computerist



By Elliott MacLennan
Attorney at Law

25% R & D Credit

Attracting investors to fund a new product development is totally unlike attracting buyers via a selected market once the product is developed. If you have a finished product, you attract buyers (and licenses) by advertising. You cannot simply place an ad to recruit new product money, because you will run afoul of state and federal Blue Sky laws. Severe penalties result when these are violated.

These laws are designed to prevent the unscrupulous from offering a piece of Blue Sky or Watered Stock to the unwary investor. Such ads are either illegal or have been qualified by state Blue Sky commissions and the Securities and Exchange commission. Such qualification alone will cost $15,000 to over $100,000. The following three practical alternatives range from most to least expensive.

In a broker-dealer market, you submit your new product offering a memorandum (sometimes called a prospectus) to a broker-dealer who is licensed by both federal and state commissions to solicit investor's capital. Broker-dealers usually have the access to a larger investor pool than do the other two alternatives. Typically they will charge 10-20% of the capital raised for your new product. If you select this approach, you may wish to consider stacking a product array in tandem. For example, you may choose to include five new products in one prospectus. In selecting a broker-dealer, locate one who has experience in technological products as opposed to a broker-dealer whose principal capital location work has been in real estate.

The offering memorandum or prospectus is a lengthy document—40 to 120 pages. My last full prospectus was 100 pages. About 60-85 pages are typical. To present the prospectus to a broker-dealer, be sure to include a deal sheet —an abbreviated summary not exceeding two pages. It summarizes the product, the financial return for the investors and the tax write-off.

Another method is through certified financial planners, many of whom are licensed by the National Association of Securities Dealers. In a more restricted sense, they can offer your new product to potential investors.

Finally, you can offer for sale to a potential investor with whom you have a pre-existing business or personal relationship.

Regardless of potential investors' business or personal relationships, each must be able to fend for himself from an investment selection perspective. This legal standard was announced by the U.S. Supreme Court in the Ralston Purina case.

Before discussing certain tax consequences, it would seem appropriate to mention what motivates an investor. Financial return? Product attraction? Tax write-off? My experience is that tax considerations, financial return and product attraction are generally the investor motivation hierarchy. Tax benefits always infiltrate in the investor's decision. Prior to August 4, 1981 when Congress passed the Economic Recovery Tax Act of 1981, R & D ventures were the poor sister of other investment opportunities.

Now the new 25% Research and Development credit is law (commencing June 30, 1981 and terminating January 1, 1986). This time span is called the sunset provision. As a tax lawyer, I am amazed at this legislative commitment to help underwrite new technological directions.

Categories for credit

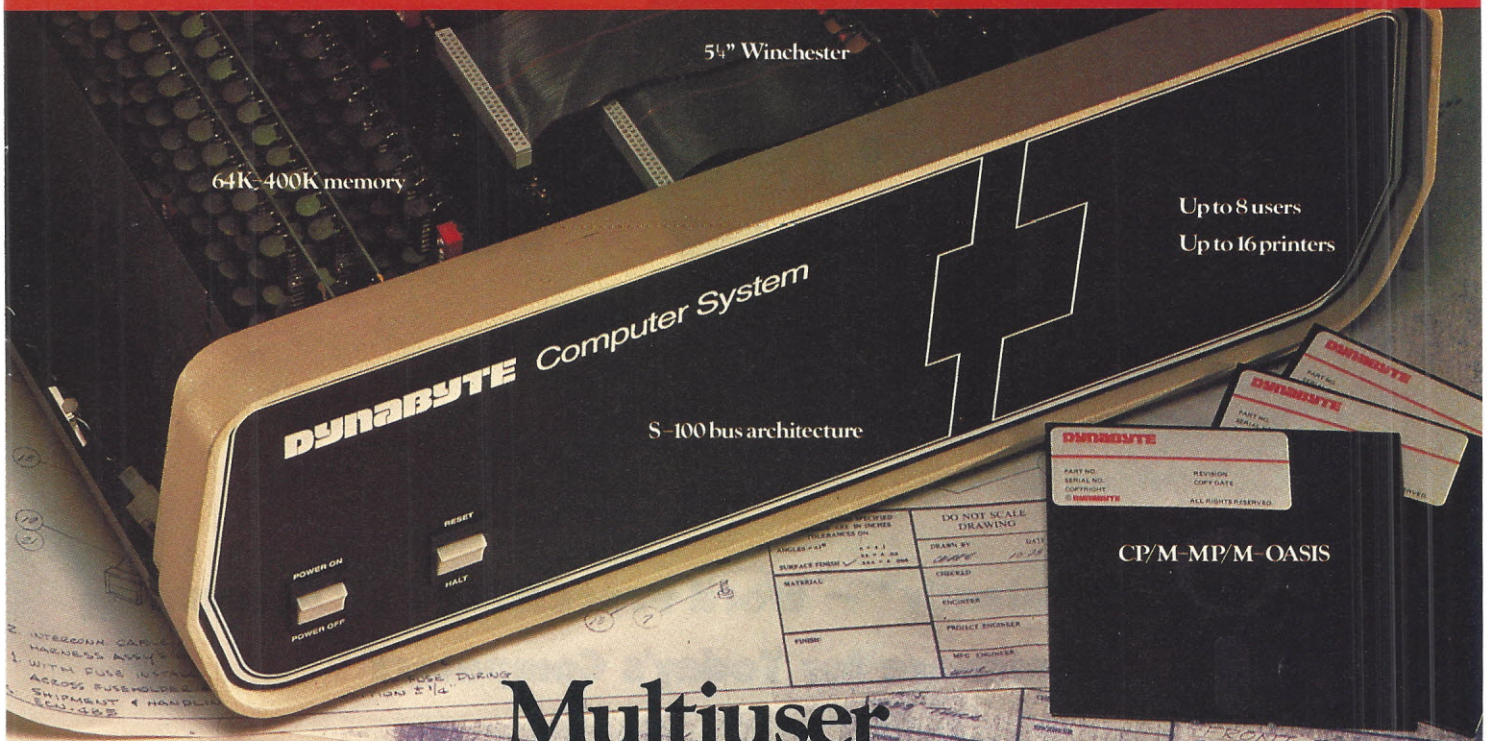
The credit is divided into two parts: in-house research expenditures and expenditures performed by outside organizations. In-house expenditures receive 100% of the 25% credit; outside expenditures receive 65%. The credit is in addition to the regular R & D deductions. Additionally the credit is permitted whether you elect to currently expense or spread out the R & D deductions by amortization.

Included categories for the credit are: 1) direct, support and supervisory wages for persons engaged in research and development; 2) supplies consumed in research activities; and 3) leasing of computers, payments for computer time. Excluded are: general and administrative expenses and indirect research expenses.

To prevent the credit incentive from converting R & D ventures into abusive tax shelters, Congress limited the credit to R & D income: A taxpayer may not offset his regular income by the credit. Excess or unused credit may be carried back three years before June 30, 1981 and carried forward seven years from that date. Lastly, the 25% credit is an incremental credit. In essence the 25% credit applies only to the average of the prior three years.

To say that the new credit is a boon to R & D ventures is an understatement. Usually an R & D venture designer shops around to locate a broker-dealer or NASD representatives. In the past month, I've had three calls from broker-dealers asking if I had any "high-tech" products. One asked if I had any "medium-tech" prospects. I know what high and low technology means but I had to ask what "medium-tech" meant. The response was "anything that qualifies for the R & D credit."□

Product Highlight: Dynabyte 5505.



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CIRCLE INQUIRY NO. 36

GAME CORNER

by Patrick and Leah O'Connor

Cubemadness

Within a few short years, the Rubik's Cube has made the transition from an unknown puzzle-box to an almost universal diversion for people in all walks of life. Computer programs that emulate the various permutations of the cube in an effort to determine the minimum-path solution to straightening-out have already been written. A good deal of software development is no doubt underway to bring the cube to the tube in ways yet undreamt-of.

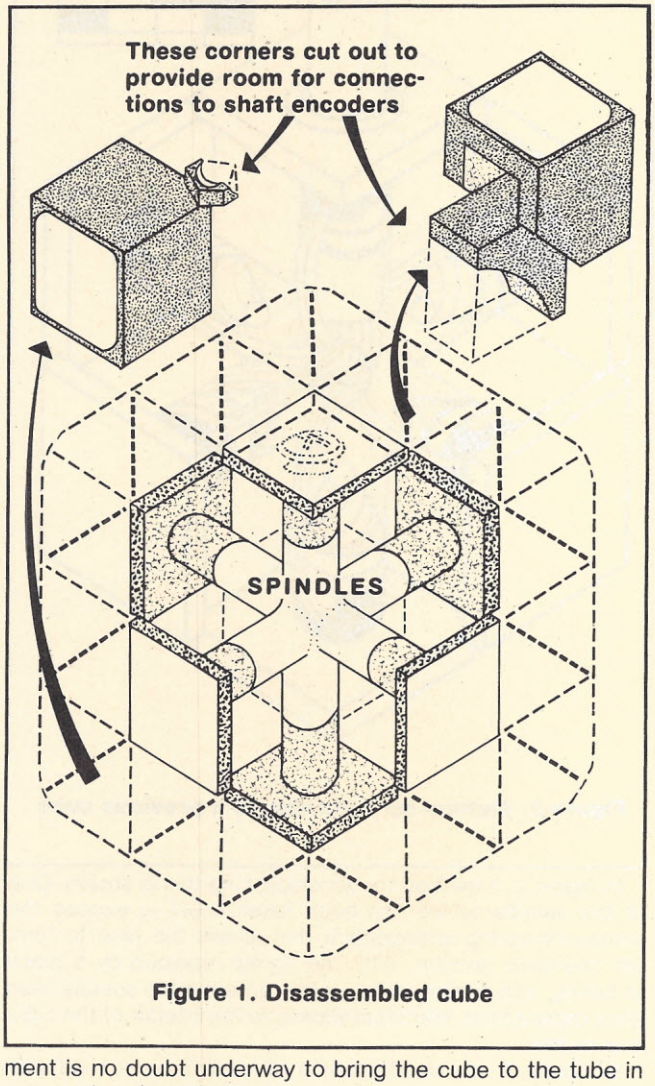

Figure 1. Disassembled cube

Following is a suggestion for a hardware-software combination that would use the Rubik's Cube as an input device, so that the computer can keep track of the movements of the cube-operator. The associated program would be responsible for keeping track of the moves that were already made, so that a budding cubemeister could always get back to the unscrambled cube position the hard way (by reversing all the moves he made) when things get messed-up enough for the operator to be desperate.

The cube interface and its program would be a safety net for the operator, taking over the mechanical memory function that makes the difference between an operator with a disordered cube, who knows how he got there and one with a scrambled cube.

When is a scrambled cube *not* a scrambled cube? When you know how to get back, of course. This may be the result of an algorithm that leads you out of the morass in a systematic way, or it may be the result of reversing the steps that got the cube messed-up in the first place. The second method is not very economical, but when the situation looks hopeless, having a list of the steps that got you into the mess in the first place is a sure-fire way to get out again.

How does the computer see the cube? The big problem with the concentration player remembering his way back to the original cube arrangement is the 3-D color nature of the problem. It's difficult to see all six surfaces of the cube at one time, and anyone who's not a very systematic cube-juggler will easily lose track of what's happening on the facets of the cube that he can't see.

A suitably-interfaced computer, however, can see all six faces of the cube at once; and following is one way it could be done.

Figure 1 shows a picture of a cube, disassembled into cubies and the spindle that holds everything together. It's the spindle that stands still while everything else moves, and it's the spindle that we'll use as the basis for measuring the positions of the cube's faces.

We'll define an unscrambled cube in terms of the position and rotation of the center cubie on each face. The center cubie is the one attached to the spindle. If we give the face

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with a red cubie at its center a quarter-turn to the right, we want a number to come back to the computer saying that this is the face we've rotated, and which way.

A number that represents the position of the red-centered face should increase or decrease by 1 for a quarter-turn, by 2 for a half-turn, by 3 for ¾ turn, etc. Instead, the four orientations of the face should be numbered, giving each position a number, such as position "0", "1", "2" or "3", according to which way it's turned.

With this as a starting point, the return path to any previous cube would just be to reverse the rotations of the faces in the reverse order to the rotations from the starting point.

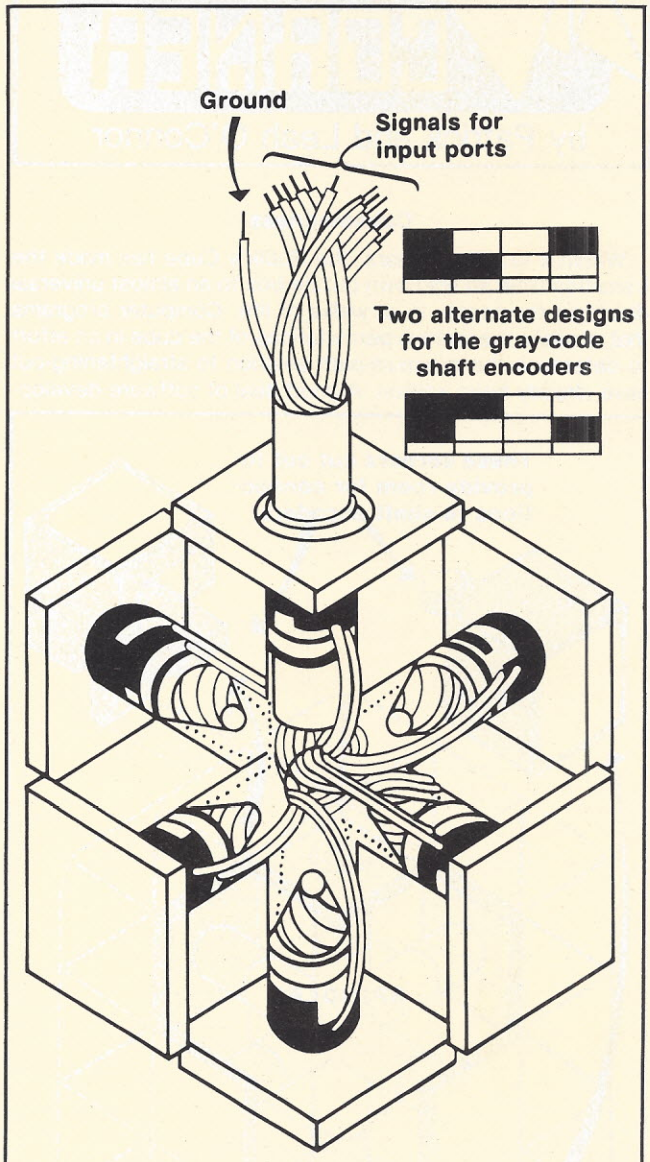

Figure 2. Method for returning to a previous cube

In figure 2, a method for accomplishing this is shown. One of the spindle-cubies has been taken apart to expose the screw-and-spring arrangement that allows the face to turn, yet maintains tension. With the screw replaced by a piece of tubing, and a cable of fine wires entering the spindle from the exposed face, electrical access to the interior of the cube is possible.

In figure 3, the shaft-position of each face is read with respect to the spindle by shaft encoders fastened to the movable part of each center-cubie. Each data word from the shaft is a gray code two-bit number. (The code, in this case, is "00" = 0, "01" = 1, "11" = 2, and "10" = 3.) There are six shaft-encoded cubies, so there are 12 wires carrying 12

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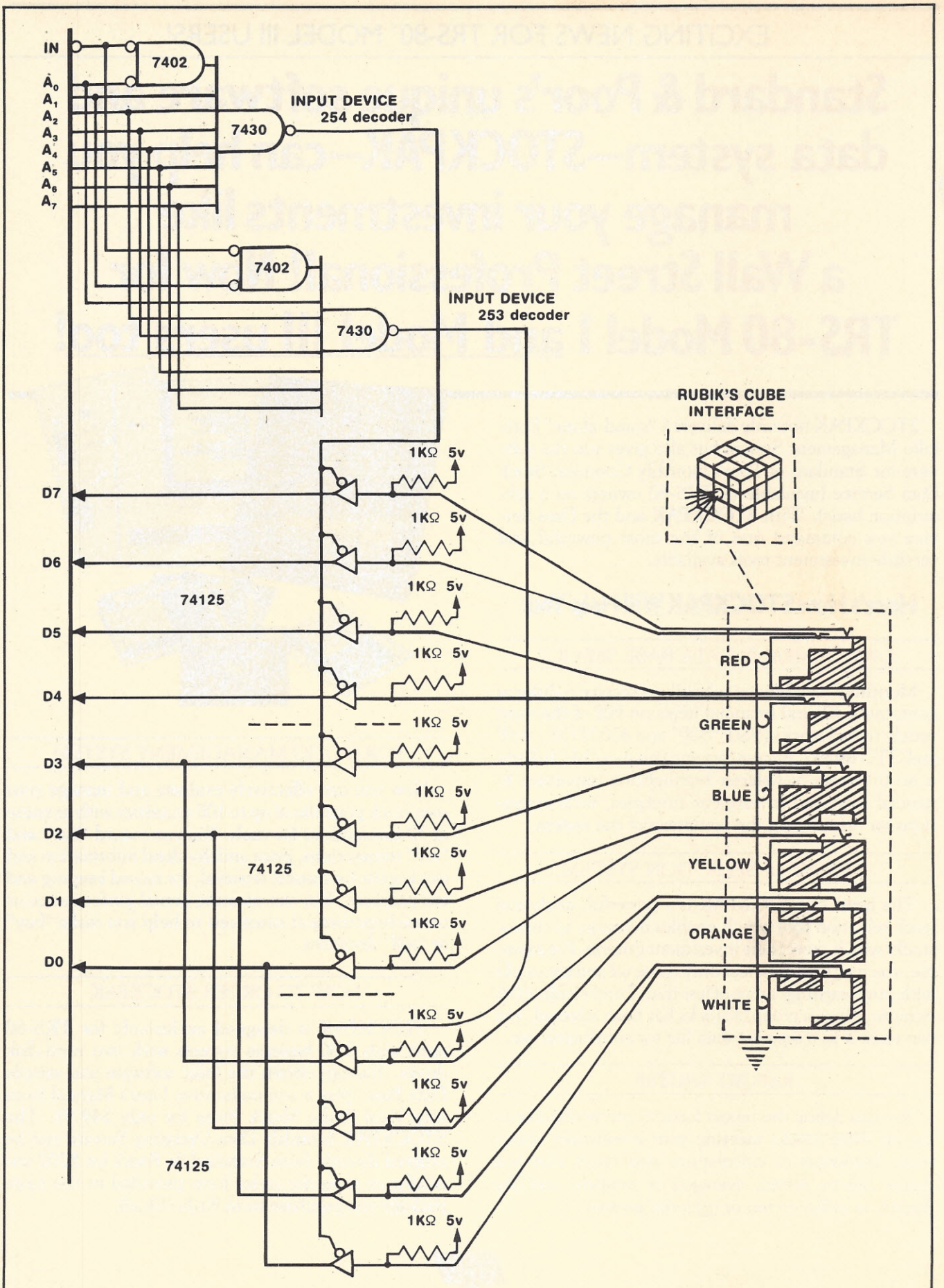

Figure 3. Each shaft-position read

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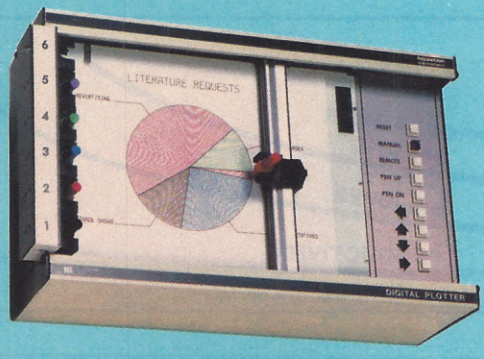

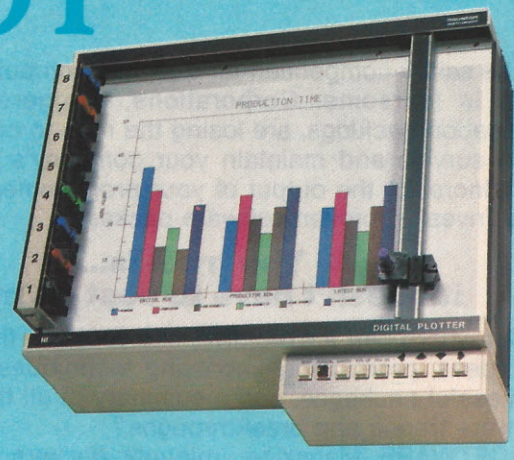

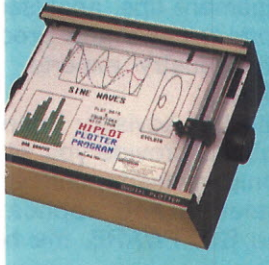

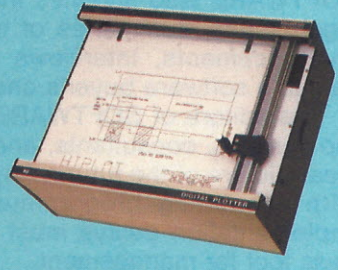

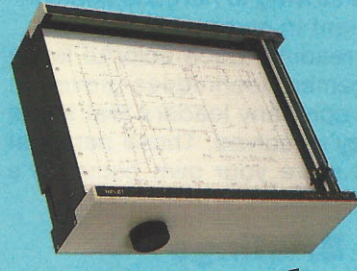

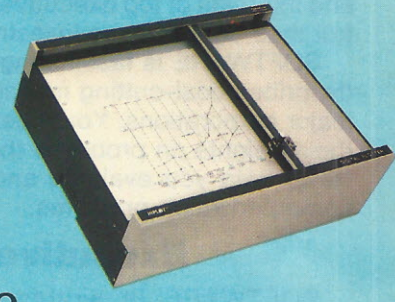

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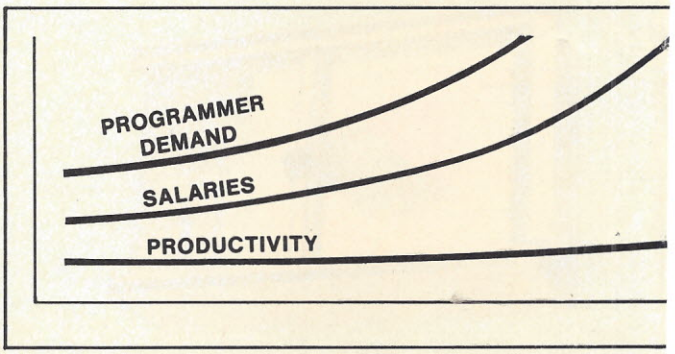

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bits of code, and a thirteenth ground wire. These are needed to provide a complete circuit for each signal.

The 12 bits of information from the cube form six two-bit dibits, which can be brought into the computer through two eight-bit input ports (actually 1½ bytes of input). It would be a good idea to re-assemble the loose cubies of the cube into a solved configuration with all the center-cubies in the "00" position. That way, the solved cube can be restored as a "00" at every face when the scrambling instructions are reversed.

Matching those numbers

This does not automatically mean that the cube cannot be scrambled, and still have a "00" on each face. It is possible to rotate the cube until all faces are "00" and still have the cube scrambled. The point of starting at "00" is to identify, as easily as possible, each move away from normal. The numbers that come back from the cube are more useful as a guide to what you did to change the cube than as absolute position indicators.

The software can go as far as you want to take it. But as a start, a program that simply shows the position after each move, saving up a list of each new set of numbers, and allowing the cube operator to play back the moves in forward or reverse order, would be a good start.

Program listing

```
          T R S   -   8 0   C U B E R E A D E R
               'MAIN PROGRAM
400 DEFINT A-Z
410 DIM R(400),G(400),B(400),Y(400),O(400),W(400)
420 N=0:M=0
430 I=INP(254):J=INP(253)
440 R(N)=(I AND 192)/64:        'SPLIT INPUT
450 G(N)=(I AND 48)/16:         'DATA INTO
460 B(N)=(I AND 12)/4:          '--DIBITS--
470 Y(N)=(I AND 3)
480 O(N)=(J AND 12)/4
490 W(N)=(J AND 3)
500 K=INP(254):L=INP(253)
510 I$=INKEY$:IF I$="R" THEN GOSUB 2000
520 GOSUB 1000: ' READ INPUT AND DEBOUNCE
530 IF N=400 THEN PRINT "THATS ALL, FOLKS":N=N-1:GOTO 520
540 PRINT "R=";R(N);" G=";G(N);" B=";B(N);
550 PRINT " Y=";Y(N);" O=";O(N);" W=";W(N)
560 I$=INKEY$:IF I$="R" THEN GOSUB 2000
570 M=0:GOTO 440
               'DEBOUNCE SUBROUTINE
1000 FOR T=0 TO 50: NEXT T
1010 I=INP(245):J=INP(243)
1020 IF(I=K) AND (J=L) THEN N=N+1: RETURN
1030 K=INP(254): I=INP(253)
1040 GOTO 1000
               'SUBROUTINE TO REVIEW MOVES
2000 CLS
2010 M=M+1:IF M=400 THEN RETURN
2020 PRINT "R=";R(M);" G=";G(M);" B=";B(M);
2030 PRINT " Y=";Y(M);" O=";O(M);" W=";W(M)
2040 I$=INKEY$
2050 IF I$="R" THEN GOTO 2010
2060 RETURN
```

Next, you would probably want to program a routine that simply lists which face was rotated (in terms of the colored square at the center of the face) and by how much, in which direction, without listing the other numbers—as long as they didn't change.

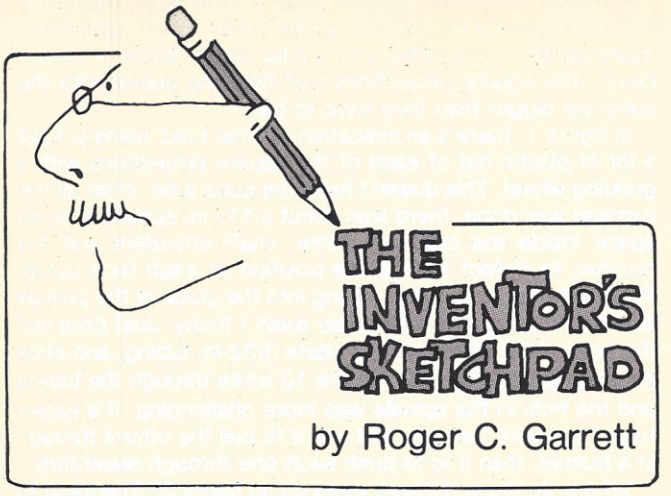
A reverse-listing program that would play back the moves in reverse order, but showing the inverse move operation, (such as "rotate the red-centered face 3 to the RIGHT" if that face had been rotated 3 to the left) would be even better than the simple reverse-listing program. A smart program that could figure out that "1 to the right" is the same as "3 to the left" would be better yet. Once the basis of a cube-input program is worked out, the way in which you choose to use the data input from the cube is limited only by your own imagination.

Anybody who's ever taken a Rubik's Cube apart will notice that there's not a lot of spare space inside. Each cubie interdigitates with its neighbors by a little corner block or center block. The square projections that hold the cubies into the cube are bigger than they have to be.

In figure 1, there's an indication of what I did; namely, I cut a lot of plastic out of each of the square projections with a grinding wheel. This doesn't harm the cube a bit. After all the carnage was done, there was about a 1½-in. sphere of open space inside the cube for wires, shaft encoders and the brushes to detect the spindle-position of each face cubie. Putting the piece of metal tubing into the place of the phillips screw in the opened face-cubie wasn't tricky. Just bore out the hole a little bit to accommodate 3/32-in. tubing, and stick it in with super glue. Getting the 13 wires through the tubing and the hole in the spindle was more challenging. It's easier to get one wire through, and use it to pull the others through in a bundle, than it is to push each one through separately.

Where do those thirteen wires go, in figure 3? The input to a computer varies with its design. Mine is a TRS-80 model I and has true I/O signals on its control bus. I've called these IN and OUT on the diagram. The triangles are called buffers. With enough buffers, and a connection to the computer's data bus, anything can become an input device.

In figure 3, the cube was interfaced into input ports 254 and 253 (decimal) on the TRS-80 bus. A program in level II Basic uses the INP (n) instruction to fetch the code from the cube. To divide the code into separate dibits for each face, the logical AND operation gets rid of the unwanted bits and a divide-by 4, 16 and 64 move the bits over to the right place so that every face's position is "0", "1", "2" or "3". This program does only the minimum operation possible, mainly listing the moves made, and adding a new move whenever a new number comes in from any of the encoders. Contact bounce is a problem with any arrangement like this, so a debouncing routine has been added as a subroutine. □



by Roger C. Garrett

C.Plus (Conclusion)

In the past two issues, I have been describing C.plus, a programming language that I have developed based on the C language, which operates under the UNIX operating system. Thus far I discussed the basic idea of structures, logical and arithmetic operators and assignment statements. This concluding chapter covers the flow-of-control structures and presents the actual C.plus file that defines all of the necessary keywords for implementing the language.

The accompanying listing should be copied into a file named C.plus and a reference to it (via a #include statement) should appear at the beginning of every program utilizing the language.

There are several structures in C.plus that may be used in the executable section of a function definition (as opposed to structures defined in the data definition section), which provide the means for controlling the flow of execution. They consist of the following:

DECISION STRUCTURES
LOOPING STRUCTURES

All such flow control structures (with the exception of infinite looping types) make use of logical expressions.

Logical expressions, like arithmetic expressions, are evaluated during the execution of the program but, unlike arithmetic expressions, return logical values (i.e. *true* or *false*) rather than numerical values. Logical expressions are always enclosed within parentheses.

There are two basic types of logical operators—unary and binary. The only valid unary logical operator is:

not

The *not* operator has the following form:

(not LOGICAL_EXPRESSION)

If the logical_expression is true, 'not logical_expression' has a value of false. If logical_expression is false, 'not_logical_expression' has a value of true. It reverses the logical value of the logical expression.

The valid binary logical expressions are:

equals
is not_equal_to
is greater_than
is less_than
is less_or_equal_to
is equal_or_greater_than
and_also
or
exclusively_orred_with

Note the use of the word *is* in many of the logical operators. It stands alone, not connected to the following phrase by the underscore character. In particular, note that the *equals* logical operator does not use *is*. It is invalid to use *is equal to*; you might use just *equals*. This unfortunate situation is a result of the ridiculous restriction imposed by the basic C language that only allows 8-characters of significance in any identifier. Several alternatives were tried in defining easily readable structures. This was one that suffered a bit due to the 8-character limitation.

The first six logical operators above operate on numeric expressions but return logical values. For example, in

if (x is less_than 34)

x must be numeric. The value of 'x is_less_than 34' is true if, indeed, *x* does have a value less than 34; otherwise, it is false. The remaining three logical operators operate on other logical expressions.

The general formats, then, are as follows:

```
( NUMERIC_EXPRESSION_1
  equals NUMERIC_EXPRESSION_2 )
( NUMERIC_EXPRESSION_1
  is not_equal_to NUMERIC_EXPRESSION_2 )
( NUMERIC_EXPRESSION_1
  is greater_than NUMERIC_EXPRESSION_2 )
( NUMERIC_EXPRESSION_1
  is less_than NUMERIC_EXPRESSION_2 )
( NUMERIC_EXPRESSION_1
  is less_or_equal_to NUMERIC_EXPRESSION_2 )
( NUMERIC_EXPRESSION_1
  is equal_or_greater_than
  NUMERIC_EXPRESSION_2 )
( LOGICAL_EXPESSION_1
  and_also LOGICAL_EXPRESSION_2 )
( LOGICAL_EXPESSION_1
  or LOGICAL_EXPRESSION_2 )
( LOGICAL_EXPESSION_1
  exclusively_orred_with LOGICAL_EXPRESSION_2 )
```

The *if* structure is one method of making decisions in a C.plus program. It has the following general format:

```
if LOGICAL_EXPRESSION_1 then
  ———
  ———
  STATEMENT SET 1
  ———
  ———
or_if LOGICAL_EXPRESSION_2 then
  ———
  ———
  STATEMENT SET 2
  ———
  ———
or_if LOGICAL_EXPRESSION_N then
  ———
  ———
  STATEMENT SET N
  ———
  ———
otherwise
  ———
  ———
  STATEMENTS TO BE PERFORMED ONLY IF
  ALL THE LOGICAL EXPRESSIONS ARE FALSE
  ———
  ———
end_if
```

Clearly, this structure provides a method of deciding to execute one of any number of sets of statements. Each logical expression is evaluated in order. The first such statement that evaluates to *true* causes the corresponding statement set to be performed (the remainder and then ignored). If none of the logical expressions are true, the set of statements following the *otherwise* are performed. The *otherwise* section is optional. There may be any number of *or_if* sections.

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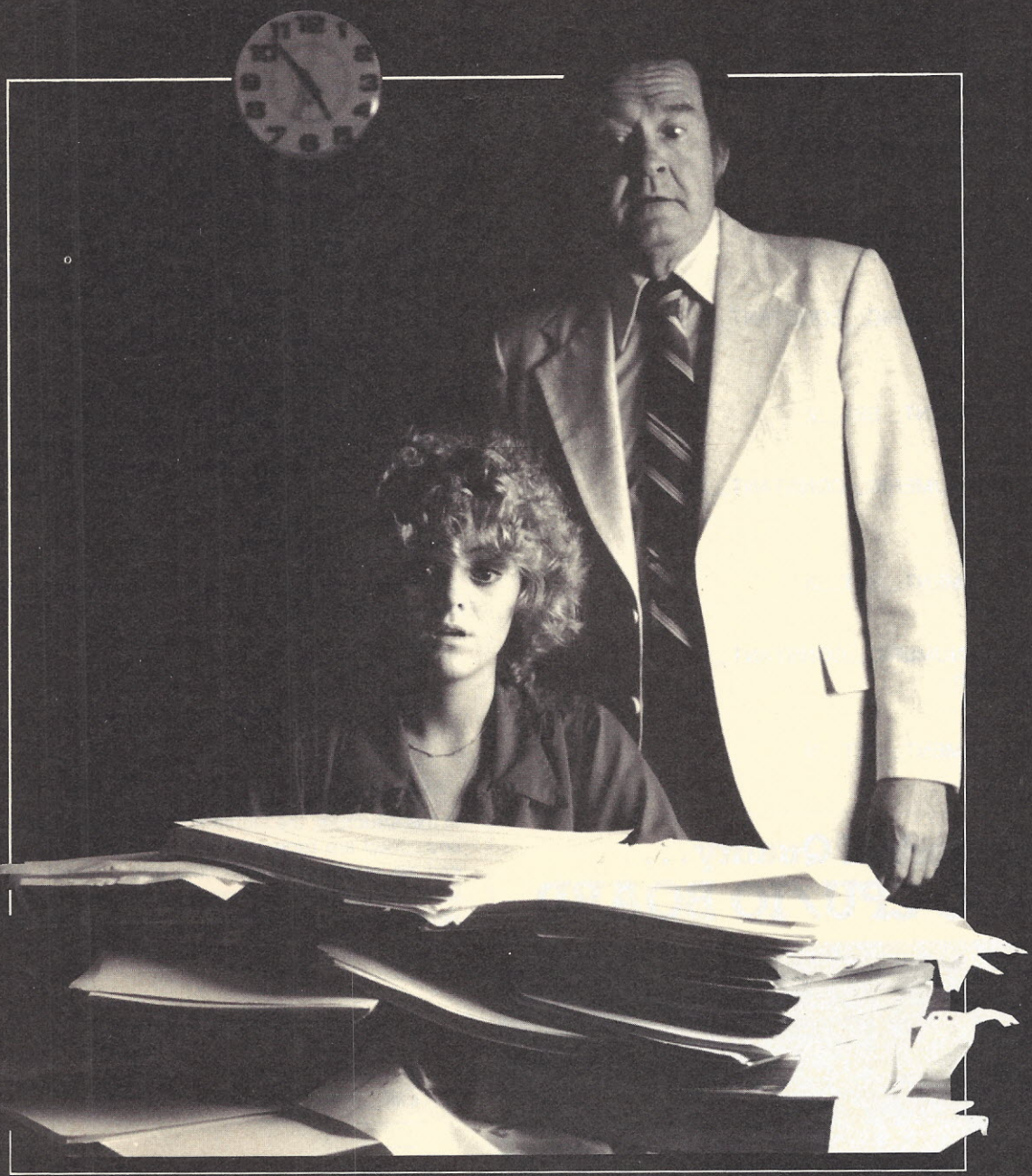

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Note that the set of statements performed within any part of an *if* structure may contain subsequent *if* structures and/or looping structures, i.e. structures are nestable. Also, each logical expression must be enclosed in parentheses.

The *match* structure is similar to the *if__else__end__if* structure, except that a choice can be made between any number of sets of statement. The general format is:

```
match NUMERIC__EXPRESSION
  with NUMERIC__CONSTANT__1
  and__then
    ———
    ———
    STATEMENT__SET__1
    ———
    ———
  or__with NUMERIC__CONSTANT__2
  and__then
    ———
    ———
    STATEMENT__SET__2
    ———
    ———
  or__with NUMERIC__CONSTANT__3
  and__then
    ———
    ———
    STATEMENT__SET__3
    ———
    ———
  or__with NUMERIC__CONSTANT__N
  and__then
    ———
    ———
    STATEMENT__SET__N
    ———
    ———
  or__if__no__match__then
    ———
    ———
    STATEMENT__SET__M
    ———
    ———
end__matching
```

The execution of the *match* structure is as follows: the numeric expression at the beginning of the structure is first evaluated. An attempt is then made to match the value with each of the numeric__constants (which follow the with and or__with statements). When a match is found, the corresponding statement set is performed. Since each numeric constant must be unique, only one such statement set will be executed during any execution of the *match* structure. If no match is found, the statement set following the *or__if__no__match__then* statement will be executed.

There may be any number of *or__with* sections (i.e. any number of numeric constants to match against) and the *or__if__no__match__then* section is optional.

There are several forms of looping structures, i.e. structures that allow a given set of statements to be performed repeatedly. These are:

```
LOOP STRUCTURE
REPEAT STRUCTURES
```

The simplest form of loop is the infinite loop, whose general format is as follows:

```
loop
  ———
  ———
  STATEMENT TO BE REPEATED
  ———
  ———
end__loop
```

In this structure, the statement enclosed between the *loop* and *end__loop* are repeatedly performed forever. The repetition can be stopped by including one or more *exit* statements within the loop (and normally appearing within a conditional structure such as an if-end__if or *match* structure) as follows:

```
loop
  ———
  ———
  STATEMENTS TO BE REPEATED
  ———
  ———
  exit__from__this__loop
  ———
  ———
end__loop
```

The word *exit* by itself can also be used. When the exit statement is encountered, control is passed to the first statement following the end of the loop. Looping structures can be nested. In this case, the exit goes to the next occurring *end__loop*.

There are three forms of repeat structures. The first has the following format:

```
until LOGICAL__EXPRESSION repeat__the__following
  ———
  ———
  STATEMENTS TO BE REPEATED
  ———
  ———
end__repeating__section
```

In the above form, the enclosed statements (which may contain any executable statements including nesting structures) are repeated until the specified logical__expression evaluates as true. The evaluation of the logical__expression is done before each execution of the set of statements. This

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means that if, upon first entry into the repeat structure, the logical_expression is true, the enclosed statements will not be executed.

The evaluation of the logical_expression occurs only once for each time that the set of enclosed statements are executed and that this evaluation occurs before each such execution. If during the execution of the enclosed statements, certain variables are modified that would cause the logical_expression to be true, execution of the enclosed section does *not* immediately stop. As with the simple *loop-end-loop* structure, the repetition may be terminated with an *exit* statement.

The next type of looping structure has the following format:

```
as_long_as LOGICAL_EXPRESSION
  repeat_the_following
    ———
    ———
    STATEMENTS TO BE REPEATED
    ———
    ———
end_repeating_section
```

This is essentially equivalent to the previous form, except that the enclosed set of statements are repeated *as long as* the specified logical expression is *true*; as soon as it evaluates to true, the repetition stops. Evaluation of the logical_expression, as with the previous form, occurs before each repetition.

The final type of looping has the following format:

```
forever repeat_the_following
    ———
    ———
    STATEMENTS TO BE REPEATED
    ———
    ———
end_repeating section
```

It should be obvious that this is functionally equivalent to the infinite loop shown above. An exit from this loop can be accomplished by using the *exit* statement.

Some user-defined functions will return values to the invoking routine. This is accomplished by including a statement of the following form within the specified function:

```
return_the_value_EXPRESSION to_the_invoking_routine
```

When this statement is encountered within a function (and by convention, it should be the last statement in the function), the expression is evaluated and the value is returned to the invoking routine.

As with standard "C", comments may be included in a program by enclosing them within the comment designators /* and */. For example, the following contains a comment:

```
set x equal_to z/* in order to initialize the screen */;
```

There are several words that are essentially null, i.e. they are ignored by the compiler, but aid in a program's readability. Examples of null words are: the, a, an, bits. More may be added to this list as C.plus becomes more formally defined.

This series of articles has described the differences between standard C and the new (experimental) C.plus. All of the standard features of C are still available when using C.plus and the reader is referred to the C documents for descriptions of all remaining language features.

C.plus is an attempt to make at least a part of the overall Structured English philosophy available in a real programming language. Structured English is both a programming philosophy and a programming language. By properly structuring English, by restricting the word choice for key words, yet allowing a sufficiently strong instruction set, the programmer can express his thoughts in a program that is readable both to himself and the computer. □

Program on page 142

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THE MICRO-MATHEMATICIAN

by Dr. John C. Nash

The Comstar Compiler

The relative merits of compiled versus interpreted program code are frequently debated by computer users. This month, I hope to contribute something other than unfounded opinion to this debate by reviewing a relatively new product. This is Comstar, a compiler for North Star Basic, marketed by Allen Ashley, Pasadena, CA.

The software was tested on a double density North Star Horizon. (The software does not run on single density systems. All timings are reported using a stop watch, as appropriate clocking was not possible internally.) Eight-digit N* Basic and FPBasic were used, as the Floating Point Board (FPB) was available. We were, therefore, able to test the capability of Comstar to use this device as claimed, which is particularly appropriate for mathematical computations.

First, let's look at the timing comparisons for three different mathematical operations. Consider a matrix inversion program.

Listing 1.

```
1000 REM ALG. 9 BAUER REINSCH INVERSION
1010 FOR K=N TO 1 STEP -1\REM STEP 1
1020   S=A(1)\REM STEP 2
1030   IF S<=0 THEN EXIT 1160\REM STEP 3
1040   M=1\REM STEP 4
1050   FOR I=2 TO N\REM STEP 5
1060      Q=M\M=M+I\T=A(Q+1)\X(I)=-T/S\REM STEP 6
1070      IF I>K THEN X(I)=-X(I)\REM STEP 7
1080      FOR J=Q+2 TO M\REM STEP 8
1090         A(J-I)=A(J)+T*X(J-Q)
1100      NEXT J
1110   NEXT I\REM STEP 9
1120   Q=Q-1\A(M)=1/S\REM STEP 10
1130   FOR I=2 TO N\A(Q+I)=X(I)\NEXT I\REM STEP 11
1140 NEXT K\REM STEP 12
1150 RETURN
1160 PRINT "MATRIX COMPUTATIONALLY INDEFINITE"
1170 STOP\REM END ALG. 9
```

The particular one chosen is an implementation of the Gauss Jordan method as modified by F. Bauer and C. Reinsch. Listing 1 shows the main subroutine.

This code was compiled with a simple driver to build the symmetric text matrix A defined by

$$A(i,j) = j = A(j,i) \text{ for } j \leqslant 1$$

called the Frank matrix. The 5 by 5 version, is therefore

1	1	1	1	1
1	2	2	2	2
1	2	3	3	3
1	2	3	4	4
1	2	3	4	5

This matrix is stable under inversion. For any order, n, the inverse $X = A^{-1}$ is given by

$X(i,i) = 2 \qquad$ for $i = 1,2,\ldots,(n-1)$
$X(n,n) = 1$
$X(i,i-1) = X(i-1,i) = -1 \qquad$ for $i = 2, 3,\ldots, n$
$X(i,j) = 0$

Thus, for $n = 5$

$$\begin{matrix} 2 & -1 & 0 & 0 & 0 \\ -1 & 2 & -1 & 0 & 0 \\ 0 & -1 & 2 & -1 & 0 \\ 0 & 0 & -1 & 2 & -1 \\ 0 & 0 & 0 & -1 & 1 \end{matrix}$$

Observed timings in seconds are as follows in timings for the inversion of a symmetric, positive-definite matrix of order n by the Bauer-Reinsch method (seconds).

n	N* Basic	Comstar	Ratio	N* FPBasic	Comstar/FPB	Ratio
10	9.0	3.4	2.65	7.5	2.4	3.13
15	24.6	10.0	2.46	21.5	7.2	2.99
20	54.4	21.6	2.52	47.6	15.6	3.05
25				88.0	29.8	2.95
30				148.0	50.7	2.92

The second test program was a variable metric function minimization algorithm attempting to find the lowest point on the Rosenbrock banana shaped valley. Following is a sample run, using the Rosenbrock function:

$$F(b_1, b_2) = 100\,(b_2 - b_1^2)^2 + (b_1 - 1)^2$$

The starting point used was $F(-1.2, 1) = 24.2$. The code is unfortunately too large to be included here.

Both N* Basic and Comstar took 40 gradient and 51 function evaluations to find the minimum of the valley at $F(1,1) = 0$. The timings are highly dependent on diagnostic information displayed during minimization. Usually I display the number of gradient evaluations, the number of function evaluations and the lowest function value, so far at the top of each iteration. Timings in seconds with and without such display are as follows in minimization of the Rosenbrock function by the variable metric method (seconds).

	N* Basic	Comstar	Ratio	N* FPBasic	Comstar/FPB	Ratio
With display	62.0	38.4	1.61			
No display	37.0	14.0	2.64	30.0	6.9	4.35
No display and removing CTL-C calls but keeping line number breakpoints (Comstar directive REMFNCONT1)					6.3	4.76

Finally, in a test that is perversely designed to disadvantage the compiler, we ran the benchmark given in listing 2. This should spend most of its time in the transcendental function routines for EXP, SIN and COS. We observed:

Listing 2.

```
10 PRINT "TRANSCENDENTAL FUNCTION TEST - START"
20 DIM X$(1)
30 INPUT X$
40 FOR I=1 TO 500
50 LET X=EXP(SIN(COS(I)))
60 NEXT I
70 PRINT "DONE"
80 STOP
```

N* Basic	Comstar	Ratio	N* FPBasic	Comstar/FPB	Ratio
57.2	55.4	1.03	9.7	7.5	1.31
Removing CTL-C calls and line numbers (FNCONT0)				7.2	1.35

To put a perspective on the above timings, I quote from a letter Allen Ashley wrote to me describing the compiler: "I can

construct benchmark programs which show my compiler...(to) offer less than a 20% improvement in speed. Such programs trap the processor heavily in the trancendental functions, for which the compilation offers no speed improvement. Typical programs, which contain a mix of operations, run three times as fast. On the remote side, a factor of five might be achieved for contrived programs. An eightfold speed increase is doubtful without program modification."

String sort program

Since this letter, Allen has received notice from a user of a 12-fold increase on a particular program involving string manipulation. Though this review concerns mathematical software, I tried a string sort program and achieved speed increases of over 3 with software floating point and over 4 with FPB. Interpreter timings are, of course, also sensitive to program structure and code length.

Now, let's consider how we found the Comstar system to bring up and use. The software comes on a double density N* diskette. Space is provided for the N* DOS (we used version 5.2D at 0100H). The files on the disk are:

COMPILE—the program that converts (tokenized) N* Basic source to macro-assembly level source code for MAKRO. As such I would prefer to call COMPILE a translator, since it does not produce machine code directly. Note that the intermediate assembly files are quite large.

MAKRO—a disk based macro-assembler for Z80 and 8080 machines.

PROCOM—a command file processor (allows "catalogued procedures" to be executed such as compile, assemble and link steps).

Compiler library—a suite of routines that are called by compiler programs to perform input/output, arithmetic or special functions.

CLINK and LINKC—linker/loaders to bring together the appropriate object code from compiled and assembled user programs and the compiler library.

EDIT—a text editor (not needed for Basic programs).

Following page 1-3 of the manual for Comstar, we copied the disk to our working disk and copied a version of the DOS to the working disk as well. We then followed the instructions to modify system addresses by re-assembling a program called SLBDISK using MAKRO. During assembly, this requests addresses for BOOTUPLOC (the N* boot PROM address), FPBADDRESS (the location of the floating point board in memory or zero if no FPB present), and the DOS start address. These were requested in an order different from that suggested by the manual, but the procedure was easily followed.

We did not initially need to change the floating point operations file to use the FPB and skipped to compiling the matrix inversion program. After removing any restricted code (see the accompanying table), we invoked PROCOM and told it to execute commands in COMPCOM, a file of statements deigned to compile, assemble and link a Basic program.

At this point, we encountered some difficulties because the system we were using employs a small segment of the top of memory for a work area for input/output routines stored in a PROM on the N* processor board. Several Comstar programs use a routine that searches for the top of memory and, hence, conflict with this area. These are documented for the assembler MAKRO, the editor EDIT and the linker/loaders CLINK and LINKC, but not for COMPILE. Furthermore, the memory upper bound for the compiled user code is established

Restrictions to N* Basic accepted by Comstar

Topic	Restriction
Dimensions	Dimensions must be fixed, i.e. DIM A(100) *not* DIM A(N). Dimension arrays before using them.
Disk file numbers	Must be decimal constants 0 - 7; expressions prohibited.
I/O file numbers	Expression, if present, must evaluate to less than 8.
FOR/NEXT	A single NEXT must exist for each FOR, and must appear after it in the source code.
DEF FN/FNEND	Formal parameters must be simple, non-subscripted variables. All statements in the FN must precede the FNEND.
ERRSET	Limited to transfer of control to the error recovery destination specified. Optional variables for line number where error took place and for the type of error are permitted in N* Basic but, ignored by Comstar.
Initial values	Program variables are initialized at load (all variables, arrays and strings are actually stored as part of the object code. Re-entry at the start address does not re-initialize the variables. The file must be reloaded with LF or GO to do this.
CONTROL-C stop	No CONTINUE possible after such stops.
STOP/END	Treated identically by Comstar.
CHAIN	Comstar requires chained program to be a compiled and linked N* type 1 file with a GO address; i.e. CHAIN "filename" is converted to GO filename.
Array and string pointers	Comstar has special provisions to allow for the passing of string and array location pointers to compiled functions.

in a similar manner. Comstar provides for adjustment of the top of memory address in a program called MEMSET. We could unfortunately not find any documentation of this, and disassembled it before discovering how easy it was to use. Allen Ashley had not, at time of writing, received comments regarding memory limits and will presumably document the simple adjustments needed for systems that must reserve space in memory.

The compilation/assembly/linkage takes some time. The largest program, the function minimizer, has about 170 lines of Basic code and required 3½ minutes to compile. The smallest, the transcendental function benchmark, took 72 seconds. Note that this "little" program generated 28 blocks of object code, mostly in the form of routines linked from the compiler library.

Comstar, as used, left the object code in memory starting at 3400H with the message:

```
SAVE 28 BLOCKS AT 3400
PROGRAM RUNS AT E00
```

The user must save and reload the program code. I feel that the save could be at least partially automated, even though the program would have to dynamically allocate disk space.

A few disadvantages are worth mentioning. The compiler uses double density files exclusively. Even single disk Basic source is prohibited. The diagnostic output from the COMPILE/MAKRO/CLINK programs under the control of PROCOM is not very compact. On a screen this is acceptable, but hard copy terminal users would find the paper use annoying. I feel that attention to formatting could improve this. Once initiated, the compile sequence is hard to abort without resetting the system, even when errors have been observed. PROCOM is aborted by CTL-Q, while MAKRO may at times be stopped with CTL-C. COMPILE appears to have no abort mechanism. During the linkage phase, it would be nice to see the sizes of the files containing the various modules being linked as well as their names.

Documentation seems quite good. Relatively complete, it is nevertheless not bulky. Layout is generally very good and there is an index to help in finding topics. One suggestion is to put warnings about memory limits and abort mechanisms up front where users could be made aware of them before the system is activated.

Despite any of the comments made in this review, the difficulties encountered were not major. We did not exercise all of the functions of the system, of course, nor did we engage in any fancy work with compiler or assembler directives or with in-line assembly code in the Basic source. We did try to suppress the generation of calls to the CTL-C routine. By putting REMFNCONT0 in the source program, such calls as well as line numbers are supposed to be suppressed. REMFNCONT1 is supposed to only suppress the calls to the CTL-C routine. We found the former option to give "undefined label" errors at the assembly stage of the compilation process for three of the four of our programs. Comstar also has a suite of support routines available to carry out such operations as matrix arithmetic, internal sorting and extended precision arithmetic, which we did not attempt to try.

Because compilation requires certain parameters to be established before execution, there are some restrictions on the Basic code that may be used. These are listed briefly in the table.

Comstar is reasonably well put together. The claims for it are borne out by my tests. Only the individual user can decide if the effort of removing coding restrictions and waiting for compilation is recovered in the reduction in execution time by a factor that is typically 3. I wish the system were available for single density systems, since I consider it would be very useful in attacking some problems I have encountered that have required up to 44 hours of computation using FPBasic. The price is $400, with an interface available for an additional $75. □

Learning with Micros

by Louis E. Frenzel

Choosing an Educational Micro

Some people will buy a new car for its appearance or because a friend has one or because they have heard something good about this model. Believe it or not, some people buy computers for similar reasons. While you may be lucky with this approach and end up with a computer that does the job for you, you also stand the risk of ending up with a white elephant. If you are going to make the kind of investment a computer requires, you would be more comfortable if you go through a more logical and careful examination of the situation. This is particularly true if you are in charge of a volume purchase for your school.

The first step in selecting a computer is defining just what you are going to do with it. Most people know what their main application is. List all of the applications you plan. For example, educational users might include teaching computer literacy or languages, CAI, writing instructional software and administrative functions such as student records. Once you've defined your applications, rank them in order of importance. Try to anticipate future uses.

Now you can begin your shopping. There are several factors to consider. The most important one is software. This is the element that will tailor the computer to your particular application. If there isn't any software available to implement your application, you will encounter difficulties. If software for meeting your administrative or teaching applications cannot be found, the computer of your choice is virtually worthless, unless you are capable of writing that software yourself or can find someone to do it. What you really should be shopping for is a system that includes both software and hardware.

The next step is to find a system that is expandable. Once you get a computer, you will quickly find that you will want to add to it or modify it to do different things. For example, the computer you select may have a 16K RAM, which may be adequate for your initial applications. However, you will discover other things to do with the computer—usually requiring more RAM. Be sure that the computer has the capacity to add additional memory and that you can add I/O ports. You will also want to add accessories such as peripherals. With more accessories and add-ons, a computer has greater flexibility and a longer life.

The first step in selecting a computer is defining just what you need it for.

Where are you going to get service and support for your computer? If you buy it from a local computer store, the store will usually provide whatever initial hand-holding and after-sale service you might need. Be sure that there is a convenient place to get the computer repaired and someone is available to ask about installation and operation. Check to see if the manufacturer offers any kind of support, such as a telephone hotline. Most people need some help in installing hardware and software.

One of the things that you should investigate is the documentation. These are the manuals and references that explain systems operation and application. If possible, examine the documentation for the computer and the software prior to the purchase. This will give you a better impression of the system. Once you've looked at these items, you may consider factors such as price, appearance and popular brand names.

Following are a few of the most popular machines in use in educational applications. This will help you narrow the field somewhat.

The Apple II computer is one of the most widely used personal computers. Apple is currently the largest (greatest sales revenue) microcomputer manufacturer. The Apple is found in homes and businesses and in many schools. As a result, there is a tremendous amount of educational software and accessories available. The company is serious about the field of education and provides a lot of relevant products and related services.

The Atari is very similar in appearance, performance and configuration to the Apple. However, it is not nearly as well known or as widely used. It is a good machine for educational purposes, and it has one of the best color graphic capabilities of any personal computer. And there is some educational software available for it. Atari offers a series of self teaching programs on a variety of subjects. Educational material suppliers such as Science Research Associates (SRA) and Dorssett offer a wide range of CAI packages for the Atari. There are two models available—the 400 and 800. The model 800 has a full standard keyboard and full expansion capabilities and is the only model to seriously consider.

The Commodore Pet was once perhaps the leading educational computer. There are more Pets in schools than any other computer. The first model was introduced in 1977 and quickly became one of the favorites for teaching computers in schools. But over the years, Commodore has concentrated its efforts in other areas. As a result, the earlier dominance was lost. Nevertheless, Pet computers are still excellent for school applications. The original Pet is no longer available, but the newer Commodore models are up-dated versions of the original. The lowest cost version is the 4016, which is the closest in configuration to the original Pet. The model 8032 is a larger and improved version. There is a considerable amount of educational software available for these machines. Commodore computers should be given serious consideration.

The company's newest computer, the Vic 20, may be the lowest priced computer on the market. At less than $300, it is a tempting choice for a school wishing to make multiple purchases. However, its greatest drawback is that it is new and there is little or no software available.

There are probably more Radio Shack computers in use today than any other type of micro. In sheer volume of computers sold, Radio Shack is clearly number one. All of the TRS-80 models I, II and III and Color computers amount to over a quarter of a million computers. And many of these are in use in educational applications. The model I is no longer available. The model II is the larger, more expensive small business machine and really isn't the best choice for educational applications. The color computer is low in cost, but there is little available software. However, Radio Shack generally supports its new products well and just recently announced a floppy disk expansion and other accessories for the color computer. The best choice for education is the model III. This is a repackaged and up-graded model I that is a dandy computer. There is a tremendous amount of educational software of all kinds available for it. The TRS-80 model III is one of the better options.

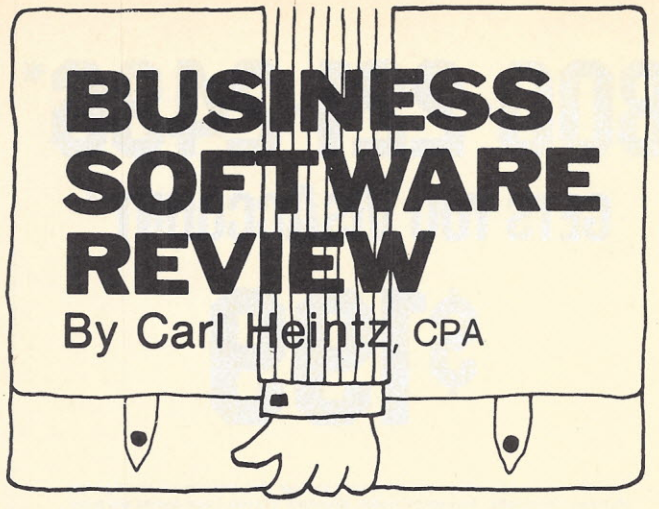
The Texas Instruments 99/4A computer is another machine to which one should give serious consideration. While TI made some initial errors in introducing the original 99/4, these have now been corrected. In addition to a lower price, the new 99/4A has a commercial grade keyboard rather than the calculator type used on the original model. In addition, there are a tremendous amount of software products and accessories available.

Educational and home market

Unlike most of the other microcomputer manufacturers, TI has deliberately decided to address only the home and educational markets. This means it has concentrated development efforts in these areas. The software is available from TI and textbook publisher Scott Foresman. And, in addition to regular accessories, which include a floppy disk, printer and modem, the 99/4A also offers a unique voice synthesizer. This allows the computer to generate high quality speech output. TI also offers the Logo language. This is a special piece of software developed at MIT and designed specifically for educational computing. At the present time, only TI offers this outstanding software.

We have not mentioned any of the Z80, S100 bus or CP/M type computers, but there are many manufacturers who incorporate these features. Some examples are Vector, Cromemco, North Star, Heath/Zenith and Xerox. However, we don't recommend these computers since there is virtually no software available for them. If your applications focus on teaching programming or special applications such as word processing, one of these machines may be better suited than the others.

One last point: You probably wouldn't buy a car before you test drove it. The same is valid for computers. If at all possible, "test drive" one with applications similar to yours before you invest. □



Tax Preparation for CP/M Systems

This month, we continue our examination of some commercially available software for the CPA or professional tax preparer. Our focus is on the Federal and State Tax Preparation system by Microcomputer Taxsystems, Woodland Hills, CA. Prices start at $250 for the basic system, and range all the way up to $1,750.

Micro Tax is a set of programs that allows the accountant to prepare federal and state income tax returns for individuals and partnerships. The modules available include: Federal Individual Tax Returns; Depreciation Computation Module; Partnership Federal Information Return Computation; and Individual State Tax Returns. (Separate modules for California, Arizona, Oregon, Illinois, New York, Virginia, Maryland, Utah and District of Columbia are available.)

The system is designed to run on any 8080 or Z80 processor with at least 56K of RAM available. One version runs on the Apple with the Z80 Softcard installed. The video unit must have 80 characters across with 24 lines per screen, scrolling capabilities and a control character to clear the screen. Any printer with an 80-column wide carriage is acceptable. To run the IRS forms, though, a friction feed will be necessary.

Disk drives required must have at least 200K of storage for the programs, plus approximately 10K per client. A total of 256 clients can be accommodated on each disk drive. (Obviously, that is more than the capabilities of even the best 8-in. double density drives, which can store only about 1 Mbyte.) The system is compatible with hard disks, and due to extensive disk access, fast drives or a hard disk are recommended.

The package is written in compiled Microsoft Basic 5.3, and requires the Run-Time module to operate. On the distribution disk, this makes booting up the system quite easy, since all the operator has to do after getting the CP/M prompt ">" is to type "TAX". It has been updated to reflect the latest tax law changes. It was written by a professor in Computer Accounting Information systems, and his wife, a former Associate Dean of a local law school. The company also has an advisory group of tax attorneys and CPAs to insure that the product is both accurate and current. Updates are available for most of the systems on a yearly basis.

The extensive menu driven capabilities are very useful. From sign-on to power-down, the system presents the user with a series of easy-to-comprehend menus. On initial booting, the system checks to see whether it is configured yet; if not, it goes right into the configuration program. The manual contains a nice explanation of how to configure the system—a process that consists of entering a few control codes for the screen and giving information about the firm name, employer ID numbers and the like. The system does not have provisions for more than one preparer, however. This could cause some difficulty in a multi-preparer office, unless each preparer had his own copy of the programs—something that would be necessary. Otherwise, each preparer could re-set the configuration program each time he signed on. Since the program is very simple to run, this could be a viable solution.

The manual contains an operator's introduction, which is essentially a glossary of terms used in the manual, a little explanation of how the computer works and the philosophy of the packages.

The balance of the manual explains the operation of the programs, with a detailed explanation for every function and every line item that can be entered. Numerous illustrations of what should be on the screen are included, as well as sample print-outs. Additionally, the manual contains a list of all possible error codes, what they mean and how to get around them.

The basic Micro Tax handles 22 schedules. In the middle range package, 28 forms can be prepared. These include:

1040	Schedule G	Form 3468
1040A	Schedule R	Form 3903
Schedule A	Schedule RP	Form 4137
Schedule B	Schedule SE	Form 4562
Schedule C	Form 2106	Form 4625
Schedule D	Form 2119	Form 4726
Schedule E	Form 2210	Form 4797
Form 1040 ES	Form 2440	Form 4972
Schedule F	Form 2441	Form 5695
		Form 6251

The capabilities of the system are more than sufficient for almost all of the normal recurring tax problems that are encountered by the practitioner.

The system allows the forms to be printed out on blank paper. The practitioner can then photocopy them with a transparency (not included) to produce a proper filled-in form. Alternatively, the practitioner can elect to have the 1040 printed out on a standard form and all other schedules printed in their entirety (an IRS-approved substitute form).

A taxpayer's return can be printed out at the time of the client interview, or the CPA can elect to wait and print out forms in a batch mode. This option is particularly useful in the middle of a tax season when the practitioner might elect to have his staff print out, collate, photocopy and staple a number of returns simultaneoulsy in an off-hour or slow time.

The first step in setting up clients is to enter data and assign a client number, which can be any three alphanumeric characters. The tax system stays logged onto one client number until it is changed. This allows for numerous iterations of the same data, and the practitioner is assured that only one client is handled at a time.

The next function is to select what schedules the client is likely to use. This is not an irrevocable selection, since schedules can be added, deleted or changed at any time. It is similar to the CPA selecting a few schedules from his supply cabinet before sitting down to a client interview.

Detailed menus included

The program has a little menu of all of the forms, along with a description of what they are used for. The menu lists the form number, the name of the form and an indication of whether this form has been selected for this client.

For each form, the CPA can request a questionnaire to be printed on the systems printer. These questionnaires contain a line number, the name of the item requested (such as medical insurance premiums, etc.), an indication of what is currently on file, and a space to write in what data will be input. The questionnaires can be printed out for each schedule or for all of the schedules and forms.

The system allows data to be stored from year to year, so that if properly used, the CPA can print out a questionnaire that contains all prior year numbers before the interview with the client for the current year's tax return.

Most of the schedules contain provisions to allow a user to input additional information. For example, in the itemized deductions schedule, there is a provision to allow the CPA to input "other interest" expense. The program allows for a description and amount. The system will accommodate as many of these descriptions and amounts as is necessary. In the printing of the return, a separate detail schedule will be prepared and printed automatically.

If a number of data elements has been entered and later it is desirable to add additional line items (as in the case of revised information), the program allows the CPA to add or delete lines of additional data.

Easy to use programs

Data entry for the programs is extremely easy. The user is prompted all the way along. The order in which information is entered is flexible too. For example, the user can elect to go right on down the forms, starting with the 1040 tax return. Alternatively, the user can jump to a specific form and complete that, going from one form to the next. When entering data within one schedule or form, there are provisions allowing the user to jump from one line number to another, and in some cases even jump to a subsidiary schedule.

Results from the data entered and computations on all supporting forms are integrated into the final 1040 automatically. There are provisions, however, to allow the user to input a result from a form on the summary 1040 for the purpose of overriding a subsidiary schedule. This feature is useful in many situations, especially in the case of a Schedule C (income statement for a self-employed person). The accountant may have all of the information needed for a Schedule C contained on his computer "write-up" system. Having to enter the information twice is a waste of time and effort. With the Micro Tax system, only the next income needs to be entered. Of course, the CPA would have to remember to include the separate Schedule C when assembling the tax return.

The data entry sequence is organized very much like the sequence that is used by an accountant to manually prepare a return. The same sense of going from one form to another, and the sequence of data entry are similar. This makes usage of the system comfortable and efficient.

Once all of the data has been entered, the user updates the files, then returns to the main menu, from which the option of computing taxes is available. The taxes are then computed by the machine, using the information entered. The program integrates all subsidiary schedules as needed, and indicates what it is doing while it makes numerous disk accesses and updates. It takes almost four minutes to run a standard return with five or so subsidiary schedules. Most of the time is spent in disk access and updates. With a hard disk, this time is reduced to about a minute.

The program automatically computes underpayment penalties, self-employment taxes, minimum taxes, maximum taxes, income averaging, alternative minimum taxes, and can even prepare estimated tax vouchers for the next year.

After the taxes have been computed, the system will display the results, or the operator may request a printout. The program produces a very abbreviated display of the results of the tax computation, including the total income, total adjustments, adjusted gross income, itemized deductions, taxable income, tax computation, total taxes, total credits, net taxes and credits, total payments against taxes, refund (or tax due) amount, percentage of this year's taxes paid in by the taxpayer, and savings (if any) from utilization of income averaging and maximum tax.

The operator can then have the return printed out on the system printer. Each schedule may be printed out separately by user choice, or the entire return can be printed. Or the user may decide to make alterations in some of the data in the return. To do so is easy; the user just elects the data entry mode and makes changes in whichever data elements are necessary. The taxes can then be re-computed.

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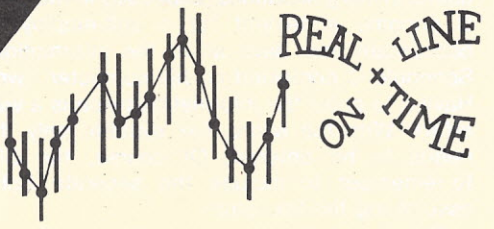

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For tax planning, the system is a little bit awkward, since there is no provision for more than one alternative to be calculated at any one time. It is possible, however, to create numerous iterations of the same taxpayer's data to determine what the results will be under different circumstances. The system has a mode designed to speed up the computation of taxes. Known as the fast mode, it makes a few simplifying assumptions about the schedules and the way they are to be processed. In the slow mode, a user can elect whether to process certain schedules or not; in the fast mode, all schedules are processed. The speed is approximately 50% faster.

The system contains an optional depreciation module, which is very helpful in the case of returns that have rental income or self-employment income. The system is not merely a little calculation unit to fill in a form—it is a complete asset file maintenance and depreciation computation system.

Up to 255 separate items can be filed for any one client. Assets are set up on the system with the following information maintained:

Class of item (used as a sort code, up to a 4 digit code may be used)
Description (up to 30 characters)
Date Acquired
Cost Basis
Prior depreciation
Method of depreciation
- Straight Line
- Declining Balance
- Operating Day
- Sum of Years Digits
- Unit of Production
- Income Forecast

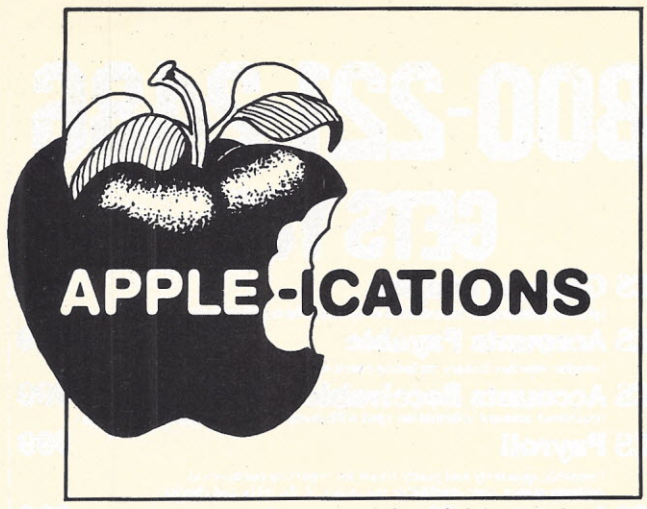
Life in years, rate in percent, units produced, days used or income received
Salvage value
Additional First year depreciation, if any

The user has the option of computing depreciation on an asset-by-asset basis, or for all of the assets on the file. It should be noted that the system is designed to compute depreciation on a yearly basis only, and it is not intended to produce interim figures. The system has a warning to indicate when it has already been updated once for a particular year.

The calculations used by the system are exact. For example, in the use of the declining balance method, the program properly distinguishes between the taxpayer's year end and the years that the asset has been owned. Suppose that an asset was purchased in June, 1981; the 1981 tax depreciation would be half the declining balance computation for the first year of the asset's life. The second tax year's depreciation (1982) would consist of half the first asset year plus half the second asset year. These calculations are made automatically, based on the asset's reported acquisition date. The system does not allow for the use of the half-year convention. It computes depreciation based upon the number of days held during the year.

The real beauty of the depreciation system is in the reports produced. They can be made to look exactly like those required for a tax return, and can be viewed on the terminal or printed out. The user can enter data for assets that apply to schedule C (business income) and those that apply to other schedules (such as rental income), and the system will produce two or more separate schedules—one for each form on the return. (A separate schedule is produced for every class of asset.)

The system is the answer to computer service bureaus for the accountant with a microcomputer. The ease of entry and use of the system makes it possible for the CPA to enter information about a client's tax situation during an interview. The return can be produced later, or while the client is there. The flexibility, power and convenience of the system are factors that make it a good choice. With its reasonable cost and availability of updates, a CPA could recover the cost of the software easily by saving on service bureau expenses, while having the ability to do tax planning and re-runs effortlessly. □



by Mike Dhuey

Dealing with DOS

Learning how to deal with DOS (the Apple II Plus disk operating system) is one of the first things you'll need to know if you want to do any advanced programming in Basic. In last month's column, we created a user interface that allowed convenient input and correction of mail labels. Now we will expand a mail list program to save, retrieve, and delete labels from the disk.

The Apple II disk operating system can be thought of as a curious telephone operator in an Apple II hotel. Applesoft Basic is the busy hotel manager giving orders over the phone to various functionaries, including the screen, the keyboard and the disk of the Apple II. Most of the commands given by the manager are ignored by the operator, even though the operator is always listening. However, when the manager shouts "Operator!" the operator takes special note of the next command.

These commands are typically used to connect the manager to a particular functionary in the hotel. The manager can only talk to one functionary at a time, although several can be standing by to receive commands when the operator connects them to the manager. Normally, the manager is talking to the screen or waiting for the keyboard to say which characters the user is typing on the keyboard. In fact, the manager spends most of his time waiting for the user to type on the keyboard. The operator watches the activity and mostly ignores it. However, when the manager wants attention to send or receive data from the disk, he sends a carriage return and a control-D character sequence to the screen. When the operator spots this, he throws away the control-D character and expects the next word to be a command. Typically, it is a command to connect the manager with a particular disk file.

The Apple II disk operating system can be thought of as a curious telephone operator and Applesoft Basic is the hotel manager giving orders over the phone.

The disk file is similar to a file clerk who receives pieces of paper and stores them either by some order dictated by the manager when the paper was sent or simply in the order they were received. (This, incidentally, is the difference between random and sequential files. Random does not imply any particular way to fit the papers in the file clerk's drawer; the papers are simply fit in horizontally so each piece is equally accessible. Sequential files can be thought of as a stack of paper with only the top piece accessible.)

In the accompanying program, we use both random access and sequential files. The mail labels are stored in a random access file, while the names are stored in a sequential file in alphabetical order. The name file is small enough to read into the internal memory of the Apple II. This is important, since adding and deleting labels require a major modification to this file each time. If the file were on disk during this modification, it could take up to 10 minutes to make an add or delete.

A physical analog would be a file drawer with individually numbered pockets that are in order from 0 to 999. Each of these can contain one mail label and a card with the number of the pocket on it. Outside the drawer are kept two cards. The first card names the pocket for storing the next label that comes along. The other is the highest pocket number used so far. We will use the variables PR% and EF% for these numbers.

A box of index cards is used to store the pocket containing a particular name, since the pockets are assigned on a space-available basis. Each time a label is stored in the drawer, the pocket number and name are recorded on an index card, and this card is put in the correct alphabetical sequence in the box. Thus, to retrieve a label the index cards are searched until the name appears on a card. Then the pocket number on the card is used in the file drawer to retrieve the actual label.

Regarding the addition of labels (input ADD), if the numbers outside the file drawer are equal (EF% = PR%), all the pockets up to EF% are full, so the label and card should be stored in the PR% pocket. The name and pocket number should be recorded on an index card and put in the correct position in the box. Finally, the card for the next pocket should be placed outside the drawer and EF% should be incremented.

However, if the numbers outside the drawer are not equal (EF%<>PR%), we are filling a hole left by an earlier deletion.

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Because of the IBM 3740 single density format, you now have the opportunity to exchange data with other computers such as IBM, INTEL, Radio Shack, DEC, etc. or operating systems like CP/M, UCSD Pascal, etc.

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Record the PR% number of the pocket and the name on an index card and put it in the correct position in the box. Store the PR% card and the label at the PR% pocket. Remove the card from this pocket that will be the next PR%.

When entering DELETE, use the index box to find the pocket number of the label to be deleted. Remove the index card from the box. Open the file drawer and remove the label and card at that pocket. Place the present PR% card in the pocket and put the pocket card outside the drawer as the new PR%.

Permanent data

This technique offers several benefits. The bulk of the data —the labels— are never moved. This is a tremendous savings in time on a floppy disk. Also, the space in the label file is automatically reused so holes never develop in the file, which would eventually have to be eliminated through some crunching of the file. Finally, the real file manipulation occurs with the Apple II memory, so it can be 100 times faster than the disk.

Line 10 begins by going to the initialization code of the program. It is good to put seldom-used code such as this at high line numbers. GOTO statements that refer to line numbers less than the current line plus 256 require the Applesoft interpreter to start at the beginning of the program searching for the line number. This can be important to speed up loops by placing them at the beginning of the program.

Lines 2000 to 2300 implement the ADD procedure. The code from lines 2080 to 2240 finds the last name in the name filed, and switches it around in the key file so the names are sorted in order of last names.

Lines 6000 through 7010 are the DELETE procedure. The variable DKEY% points to which element of the name file is on the screen for deletion and the DPR% points to the label in the file that matches that name. The index cards are the NA$ array, which stays in memory until the program is ended, causing it to be saved again to disk. The file drawer in the MAILLIST file on the disk and the number after ",R" is the pocket number in the file.

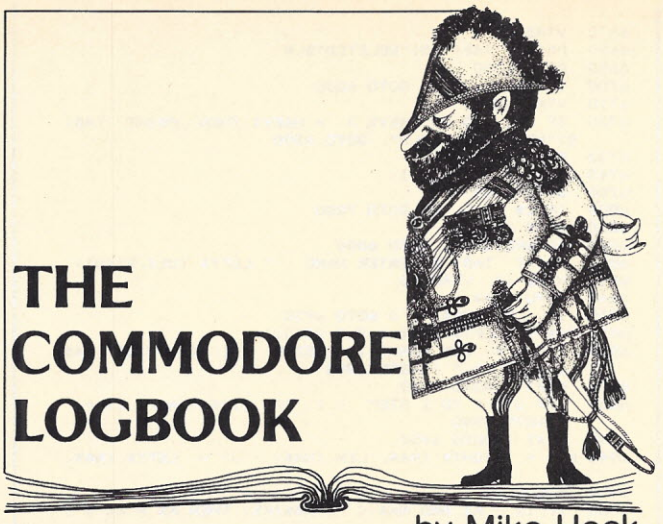
The files are saved and the card index saved at lines 11000 to 11210.

The OPENing of a file is a problem if the file didn't exist before it was opened. This is because both files have numbers stored in the beginning that indicate how many records are in the file. If the file never existed, attempts to read those numbers will halt the program. Thus, the ONERR statement will cause the execution of special start-up code when files are opened for the first time. □

Program listing

```
10  GOTO 50000
20 UL$ = UL$ + UL$: BL$ = BL$ + BL$
50 I% = 1: J% = NK%
60 K% = (I% + J%) / 2:  IF NA$ > NA$(K%) THEN I% = K% +
     1:  GOTO 400
70 J% = K% - 1
400  IF NA$ <  > NA$(K%) AND I% <  = J% GOTO 60
410  RETURN
1000  REM  ADD
1100  HOME
1110  VTAB 5
1120  PRINT  TAB( 10)"ADD NAMES"
1130  VTAB 10
1140  PRINT  TAB( 5)"(";:  INVERSE :  PRINT "A";:  NORMAL
     :  PRINT "DD, ";:  INVERSE :  PRINT "M";:  NORMAL :  PRINT
     "AIN MENU) ? ";
1150  GET C$:  PRINT C$
1160  IF C$ = "M" GOTO 50800
1170  IF C$ <  > "A" GOTO 1100
1200  FOR I = 0 TO 4:  VTAB 14 + I * 2:  PRINT FIELD$(I)
      TAB( 12) LEFT$ (UL$,SIZE(I)):DA$(I) = BL$:  NEXT

1210 LINE = 0
1220 HP = 1
1270  FOR I = 1 TO SI(0):SA$(I) = " ":  NEXT
1300  VTAB 14 + LINE * 2
1310  HTAB HP + 11
1320  GET A$:  PRINT ES$;
```

```
1330  IF A$ <  > CR$ GOTO 1450
1340 DA$ = ""
1350  FOR I = 1 TO SIZE(LINE):DA$ = DA$ + SA$(I): NEXT

1360 DA$(LINE) = DA$
1380  FOR I = 1 TO SIZE(LINE + 1):SA$(I) =  MID$ (DA$(
     LINE + 1),I,1): NEXT
1410 LINE = LINE + 1
1420 HP = 1
1430  IF LINE < 5 GOTO 1300
1440  GOTO 2000
1450  IF A$ <  > ES$ GOTO 1570
1460  IF LINE = 0 GOTO 1300
1470 DA$ = ""
1480  FOR I = 1 TO SIZE(LINE):DA$ = DA$ + SA$(I)  NEXT

1490 DA$(LINE) = DA$
1510  FOR I = 1 TO SIZE(LINE - 1):SA$(I) =  MID$ (DA$(
     LINE - 1),I,1): NEXT
1540 LINE = LINE - 1
1550 HP = 1
1560  GOTO 1300
1570  IF A$ <  > LA$ GOTO 1610
1580  IF HP = 1 GOTO 1300
1590 HP = HP - 1
1600  GOTO 1300
1610  IF A$ <  > RA$ GOTO 1650
1620  IF HP >  = SIZE(LINE) GOTO 1300
1630 HP = HP + 1
1640  GOTO 1300
1650  IF A$ < " " OR A$ > "^" OR SIZE(LINE) < HP GOTO
     1300
1655  IF A$ = "," THEN A$ = ";"
1660  PRINT A$;
1670 SA$(HP) = A$
1680 HP = HP + 1
1690  GOTO 1300
2000  IF PR% >  = EF% THEN NPR% = PR% + 1:EF% = EF% +
     1: GOTO 2050
2010  PRINT D$"READ MAILLIST,R"PR%
2020  INPUT NPR%
2050  PRINT D$"WRITE MAILLIST,R"PR%
2060  PRINT DA$(0);DA$(1);DA$(2);DA$(3);DA$(4)
2070  PRINT D$
2080  FOR I = SI(0) TO 1 STEP  - 1: IF  MID$ (DA$(0),I
     ,1) <  > " " GOTO 2100
2090  NEXT :NA$ = DA$(0) +  RIGHT$ ("  " +  STR$ (PR%)
     ,3): GOTO 2200
2100  FOR J = I TO 1 STEP  - 1: IF  MID$ (DA$(0),J,1) =
     " " GOTO 2130
2110  NEXT :NA$ = DA$(0) +  RIGHT$ ("  " +  STR$ (PR%)
     ,3): GOTO 2200
2130 NA$ =  RIGHT$ (DA$(0),SI(0) - J) +  LEFT$ (DA$(0)
     ,J) +  RIGHT$ ("  " +  STR$ (PR%),3)
2200 PR% = NPR%: GOSUB 50
2210  IF I% > K% AND NA$ <  > NA$(K%) THEN K% = K% + 1

2220  FOR I = NKEYS% TO K% STEP  - 1:NA$(I + 1) = NA$(
     I): NEXT
2230 NKEYS% = NKEYS% + 1
2240 NA$(K%) = NA$
2300  GOTO 1100
6000  REM  DELETE
6100  HOME
6110  VTAB 2
6120  PRINT  TAB( 10)"DELETE NAMES"
6130 DKEY% = 1
6200  VTAB 5
6210  IF NKEY% = 0 THEN  PRINT  TAB( 5)"NO LABELS": GOTO
     6400
6220 DPR% =  VAL ( RIGHT$ (NA$(DKEY%),3))
6230  PRINT D$"READ MAILLIST,R"DPR%
6240  INPUT DST$
6250  PRINT D$
6260 J = 1
6270  FOR I = 0 TO 4:DA$(I) =  MID$ (DST$,J,SI(I)):J =
     J + SI(I): NEXT
6280  PRINT : PRINT  TAB( 5);DA$(0)
6290  PRINT : PRINT  TAB( 5);DA$(1)
6300  PRINT : PRINT  TAB( 5);DA$(2)" ";DA$(3);"  "DA$(
     4)
6400  VTAB 18
6410  PRINT "(";: INVERSE : PRINT "D";: NORMAL : PRINT
     "ELETE,";: INVERSE : PRINT "N";: NORMAL : PRINT "
     EXT,";: INVERSE : PRINT "C";: NORMAL : PRINT "HAN
     GE NAME,";: INVERSE : PRINT "M";: NORMAL : PRINT
     "AIN MENU) ? "
6420  VTAB 20
6430  PRINT  TAB( 2)"ENTER NAME : "DA$(0)
6500  VTAB 18
6510  HTAB 38
6520  GET C$: PRINT C$
6530  IF C$ <  > "D" GOTO 6700
6540  VTAB 22
6550  PRINT BL$
6560  VTAB 22
6570  IF NKEY% = 0 GOTO 6000
6580  PRINT  TAB( 5)"CONFIRM DELETE (Y/N) ? ";
6590  GET C$: PRINT C$
6600  IF C$ <  > "Y" GOTO 6500
6610  PRINT D$"WRITE MAILLIST,R"DPR%
6620  PRINT PR%
6630 PR% = DPR%
6640 NKEY% = NKEY% - 1
6650  FOR I = DKEY% TO NKEY%:NA$(I) = NA$(I + 1): NEXT

6655  IF DKEY% > NKEY% THEN DKEY% = NKEY%
6660  PRINT D$
6670  VTAB 22
6680  PRINT  TAB( 15)"DELETED"BL$
6690  GOTO 6200
6700  IF C$ <  > "N" GOTO 6800
6710  VTAB 22
6720  IF NK% = 0 OR DKEY% >  = NKEY% THEN  PRINT  TAB(
     5)"NO MORE LABELS": GOTO 6500
6730  PRINT BL$
6740 DKEY% = DKEY% + 1
6750  GOTO 6200
6800  IF C$ <  > "C" GOTO 7000
6810  VTAB 20
6820  IF NKEY% = 0 GOTO 6000
6830  PRINT  TAB( 2)"ENTER NAME : " LEFT$ (UL$,SI(0))
6835  HTAB 14: VTAB 20
6840  INPUT NA$
6850  IF  LEN (NA$) = 0 GOTO 6950
6855 NA$ =  LEFT$ (NA$ + BL$,SI(0))
6860  FOR I =  LEN (NA$) TO 1 STEP  - 1: IF  MID$ (NA$
     ,I,1) <  > " " GOTO 6880
6870  NEXT : GOTO 6950
6880  FOR J = I TO 1 STEP  - 1: IF  MID$ (NA$,J,1) = "
     " GOTO 6940
6890  NEXT : GOTO 6950
6940 NA$ =  RIGHT$ (NA$, LEN (NA$) - J) +  LEFT$ (NA$,
     J)
6950  GOSUB 50
6960  IF I% > K% AND NA$ <  > NA$(K%) THEN K% = K% + 1

6965  IF K% > NKEY% THEN K% = NKEY%
6970 DKEY% = K%
6980  GOTO 6200
7000  IF C$ <  > "M" GOTO 6500
7010  GOTO 50800
11000  REM  QUIT
11100  PRINT D$"OPEN MAILLIST.KEY1"
11110  PRINT D$"WRITE MAILLIST.KEY1"
11120  PRINT  LEFT$ ( STR$ (NKEYS%) + BL$,27)
11130  FOR I = 1 TO NKEYS%: PRINT NA$(I): NEXT
11140  PRINT D$"WRITE MAILLIST,RO"
11150  PRINT  LEFT$ ( STR$ (PR%) + CR$ +  STR$ (EF%) +
     BL$ + BL$ + BL$,71)
11200  PRINT D$"CLOSE"
11210  END
50000  REM  MAIN MENU
50100  TEXT
50200 UL$ =  CHR$ (95):BL$ = " "
50210  FOR I = 1 TO 5:UL$ = UL$ + UL$:BL$ = BL$ + BL$:
     NEXT
50220  DIM FIELD$(5),SIZE(5),DA$(5),SA$(25),NA$(999)
50230 CR$ =  CHR$ (13):RA$ =  CHR$ (21):LA$ =  CHR$ (8
     ):ES$ =  CHR$ (27):D$ =  CHR$ (4)
50240 FIELD$(0) = "NAME"
50250 FIELD$(1) = "ADDRESS"
50260 FIELD$(2) = "CITY"
50270 FIELD$(3) = "STATE"
50280 FIELD$(4) = "ZIP CODE"
50290 SIZE(0) = 24
50300 SIZE(1) = 24
50310 SIZE(2) = 12
50320 SIZE(3) = 2
50330 SIZE(4) = 9
50400  PRINT D$"OPEN MAILLIST"
50410  PRINT D$"READ MAILLIST "
50420  ONERR  GOTO 50500
50430  INPUT PR%: INPUT EF%
50440  PRINT D$"CLOSE MAILLIST"
50450  PRINT D$"OPEN MAILLIST,L72"
50460  POKE 216,0: REM  NORMAL ERROR MESS
50470  GOTO 50600
50500  IF  PEEK (222) = 5 THEN PR% = 1:EF% = 1: GOTO 5
     0440
50510  HOME
50520  PRINT "I/O ERROR - UNABLE TO READ MAILLIST"
50530  PRINT D$"CLOSE"
50540  POKE 216,0
50550  END
50600  PRINT D$"OPEN MAILLIST.KEY1"
50610  PRINT D$"READ MAILLIST.KEY1"
50620  ONERR  GOTO 50700
50630  INPUT NKEYS%
50640  FOR I = 1 TO NKEYS%: INPUT NA$(I): NEXT
50650  POKE 216,0: REM  NORMAL ERROR MESS
50660  PRINT D$"CLOSE MAILLIST.KEY1"
50670  GOTO 50800
50700  IF  PEEK (222) = 5 THEN NK% = 0: GOTO 50650
50710  HOME
50720  PRINT "I/O ERROR - UNABLE TO READ MAILLIST:KEY1


50730  PRINT D$"CLOSE"
50740  POKE 216,0
50750  END
50800  HOME
50810  VTAB 5
50820  PRINT  TAB( 10)"MAIL LIST"
50830  PRINT : PRINT  TAB( 10)"MAIN MENU"
50840  VTAB 10
50850  PRINT : PRINT  TAB( 5)1"      ADD NAMES"
50860  PRINT : PRINT  TAB( 5)2"      DELETE NAMES"
50870  PRINT : PRINT  TAB( 5)3"      QUIT"
50880  VTAB 20
50890  PRINT  TAB( 5)"WHICH FUNCTION (1-3) ? ";
50900  GET C$:C =  VAL (C$): PRINT C
50910  IF C < 1 OR C > 3 GOTO 50880
50920  ON C GOTO 1000,6000,11000

]
```



THE COMMODORE LOGBOOK

by Mike Heck

Software for the Medical Office

The MAS package, produced by Cimarron Corp., Costa Mesa, CA, and distributed by Commodore, is a comprehensive medical accounting package, designed for a small doctor's office or clinic. It runs on the Commodore 8032 business computer, 8050 disk drive and dot-matrix or letter quality printer.

One limiting factor is the disk storage. Even with the Commodore 8050 1-Mbyte drive, more storage is needed. On the 8050 drive, about 500 active clients can be handled. However, MAS is being converted to the Commodore 8250 2-Mbyte drive and possibly a hard disk version. This conversion will eliminate any storage problems.

MAS is actually a series of programs that are linked together under one master menu. The operator should be familiar with medical practice in order to focus primary training on the program itself.

Individual programs take the operator through each process step-by-step, so that jobs like creating cash and billing journals, generating aged trial balances, processing work ticket entries and printing statements become much simpler and less error prone than using manual systems. In fact, little or no bookkeeping education is needed to perform these functions. If the operator understands the current system, the conversion to the automated one should present no major difficulties.

Before any operation can proceed, all current information regarding daily and monthly office transactions must be entered into the data base. For example, you must organize the electronic files on the data diskette to fit your office requirements. Once this is done, the system will do the organizing automatically by creating Patient, Guarantor and Work Ticket files.

The system will next ask you to create a Payment Type file. This will be the first in a series of user defined codes, allowing different types of medical offices to custom design the program to better meet their individual needs. A payment type file will be used to store common methods of payment, such as cash, check, MasterCard, Visa, etc. by a code number.

The decision command area allows you to see what you are doing and have all the options available at the same time.

After the payment type file has been created, you will next build the Doctor Master file. As an example, if your office supports two practicing physicians, both names and relevant data will be entered. Subsequently, insurance companies, referring doctors, outside service facilities, place of service facilities, diagnostic code entries and procedure (RVS, ICDA, CPT) codes are keyed in to complete the system initialization process.

You are now ready to enter all active patients and guarantors for each doctor. Beginning with Patient and Guarantor File Maintenance, general, personal, and office information regarding each patient/guarantor is entered. Once this has been accomplished, your system is fully configured for daily operation, except for opening account balances. Opening account balances (i.e. current patient receivables) are now keyed in through the Work Ticket Entry using a special procedure code. This data is retrieved from manual patient records. Automatic aging analysis is provided hereafter.

The system has now stored all data required to perform as a cash manager and accounts receivable system. However, MAS is designed to serve as an accounting system with billing and insurance form generation capability, and is not intended to provide space for patient histories.

The first step in automating the office through this system would be using the utilities to set up procedure and diagnostic codes, along with credit information, and other standard office data. Once that is done, entering patient data is the next step. Data for each patient is entered through this module before any further processing is done.

Main Menu item #1, Patient File Maintenance, provides the user with a mask with appropriate areas to fill in for patient name, address, phone numbers and employer. A section for personal data is also included. Finally, a section on office data—referring physician, last visit data, and recall date—is included.

On the bottom section of this screen, and all others, is a section called the decision command area. Here the user is prompted with the options to enter, change or delete data, or exit to another main menu selection. The advantage is being

able to see what you are doing and have all options available at the same time.

After patient entry, the next step is guarantor file maintenance. Like the patient entry mask, guarantor information is entered in the same way. In this section, you will also enter insurance information and a credit code. The guarantor entry screen also shows current receivables. However, you will not be able to delete a guarantor unless the receivable balance is zero.

Work Ticket Entry, item #3, is the real heart of the system. Information about a visit, including lab work and all procedures is entered here. It is suggested that a "traveler" or patient sheet with procedure and diagnostic codes be carried by the physician, filled in, then submitted to the operator for processing. This will streamline processing and ensure accuracy.

The section contains two Pages, or masks, that must be filled in. The first mask asks for insurance information, including dates when disability begins and ends.

The second Page, work ticket detail, concerns procedures and related information. Here, the operator fills in the actual procedure and diagnostic codes, as set-up in the utility section. Once all information is entered, Patient Forms will be printed, reflecting total due and any monies received. You will also be asked whether insurance forms should be printed at this time.

Quick entry of New Patients, item #4, is a convenient program that allows the operator to quickly enter a new patient/guarantor during normally busy hours without the necessity of moving back and forth through the main menu.

Just as the Work Ticket Entry section lets you record all matters related to billing and insurance processing, the Cash Receipts and Adjustments program provides a convenient method of recording payments and making accounts receivable adjustments. Work Ticket Entry also offers the option of receiving payment, but at the time of service. This feature encourages a fast-payment-for-services-rendered approach to managing cash. The Cash Receipts and Adjustments mask provides a space for guarantor name, date, whether entry is receipt or adjustment, check#/reason and amount.

Two menu sections for posting are provided—End of Day and End of Month. Whereas end-of-day posting takes each day's work tickets, billings and cash receipts and automatically posts the figures to the appropriate file and produces the day sheet, month-end posting is a program that electronically moves these numbers from the month-to-date file to the year-to-date file. As this procedure takes place, all details including insurance data and billing data are purged. This is required to allow for more diskette space for next month's entries. Therefore, it is very important that all transactions for the current month have been corrected and printed out prior to running the month end post.

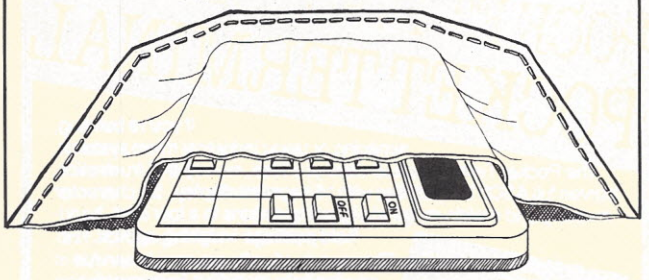
Alternative to insurance forms

The Insurance Forms selection offers an alternative to printing insurance forms at the time of service—if a patient is carried on assignment or if it is more desirable to print all insurance forms at one time. This is a batch program that will run forms for all patients processed during the month (fiscal period). It is designed for use with Universal Insurance Form C 4359 (11-78). An integral part of any accounts program is statement generation. Through item #9, statements are printed for each guarantor with active account balances. During operation, no operation attention is required.

As an added benefit of day-to-day processing of patients, the system stores an abundance of information retrievable by item #10, Reports. The reports include: Patient List, Guarantor A/R Report, Procedure Code Report, Diagnostic Code Report, Physician Report, Referral Report, Insurance Report, Location Report, Outside Services Report, Payment Type Report, Activity Reports and Recall Report. These should be fairly self-explanatory. An interesting feature is the Recall Report, which conveniently prints a list of all patients scheduled to come in during a specified period. □

POWER IN YOUR POCKET

by Bob McElwain



The Future of Handheld Computers

Many people have not yet recognized the tremendous potential of handheld computers. They ask, "What's so great? What can handhelds do that microcomputers can't? Aren't they just fancy programmable calculators?"

Handhelds will probably never match the speed of micros. But lack of speed did not prevent micros from establishing a place for themselves. It will happen with handhelds. Computing speed, fast or slow, seems magically swift to those accustomed to using pencil and paper.

The major factor that will define the significance of handhelds is portability. Handhelds will go where people go. The inherent mobility of handhelds will bring about a wide variety of unique applications. An insurance agent can build an accurate plan with his client, while they fish off the coast of California. Standing on an isolated landing strip, a pilot can determine the best load and course for his plane, to spray a farmer's field at minimal cost. A lady in a health food store can provide a personal evaluation of your vitamin deficiencies. As you ride the subway to your office, you can analyze the performance of your investments.

Although the stand-alone mode will continue to be important, there's more. Handhelds will soon be the fundamental unit of expandable, multipurpose computer systems. For example, they'll soon be used as remote, intelligent terminals. Quasar and Panasonic, with software from Friend-Amis, are heavily committed to this approach. Handhelds will be used with modems to link with larger systems, particularly data base networks. They'll be used as data gathering, report generating devices rather than processing tools.

Let's consider handhelds relative to programmables. It's incorrect to speak of programmable calculators as some sort of inferior cousin to handhelds. The words "programmable" and "handheld" are used here for discussion purposes only. In my opinion, both are computers, regardless of technical definitions. Perhaps the only reason for not giving programmables the name lies in the existence of certain tariffs charged on computers, but not on calculators. Then "calculator" may be less forbidding to potential users than "computer."

One distinction between the two at present is the availability of a high level language. Although a good language is important, language has no real impact on the nature of the device. The latest Hewlett-Packard model, the HP-41C, can store 2,000 lines of HP code. This unit is only a slight step away from providing a higher level language similar to Forth. And other features envisioned for handhelds could be included.

It seems unlikely Hewlett-Packard will enter the general computing arena with these units, even if expanded. They've been extremely successful in the engineering-scientific environment. They'll remain committed to that marketplace.

Handhelds are destined to be expandable systems for general use by a wide variety of people. Hosts of people not presently using computers will use handhelds. Programmables may blend into this arena so that all distinctions are lost, but for the short term, look for programmables to maintain specialized markets.

So much for the future. Why are so many people buying handhelds, instead of programmables, right now? They're new and relatively untried. Yet nearly 200,000 pocket computers reportedly have been sold in something not much over a year.

I suspect that architects, for example, opted for the device that was easiest to use. The Basic available on handhelds makes coding simpler than on a programmable. Also it's easier to change an existing program. Editing on handhelds is easier than on some large computers. People facing a purchase decision may choose a handheld for these reasons alone.

There are other features that are hard to beat. The formats available for prompting input and labeling output are powerful aids to error-free use. The ease with which erroneous input can be captured is a further aid to accuracy. Nested subroutines, simple string variables and dimensioned variables are built-in. Linked to a cassette recorder, handhelds can chain to another program or read and write large quantities of data. Data written can be processed at a central site.

Given the coming expandability of handhelds and the capability of linking to large systems, it's clear they are here to stay. They will be a significant part of our computing world. In terms of ordinary people, they may become the most important computing tool in use.

* * * * *

A number of interesting products are now available on pocket computers. Here are a few for which particulars are available. In each case, more details are available from the source given.

Dr. Wes Du Charme of Tracom (Denver, CO), reports that First (First Immediate Results Sales Test), a software package implemented on a Sharp pocket computer, is being used as a recruiting and selection aid by insurance agencies. Applicants spend approximately 15 minutes responding as directed by the system. Immediate feedback is provided. Data collected to tape are processed at a central site. Further reports are available, along with a variety of comparative information from the over-all data collection process. The system has been able to predict applicant success with consistent accuracy.

Ken Rose of Compu-Close (Simi Valley, CA) produces a system that is being used by insurance agents as a sales aid. The computer contains all necessary rates and information to tailor a complete package to an individual's needs. Using procedures of top salesmen in the industry, the system sustains an interactive mode with the client. With answers to simple questions, such as "How much can you afford?" and "How much monthly income would your family need?" the computer generates an optimal plan. By eliminating the need for extensive tables, the system saves agents hours every day.

Dr. Leon Smith of Lemax Corp., Westminster, CA, reports Sharp units are being used to train students of nutrition, people who will be "computer-using doctors" in the future. Further, several software packages are now being marketed with the computer as a system. One package turns the computer into an analyzer of nutritional deficiencies, muscle fat ratios and various health conditions. Another analyzes stress and reports on best solutions. These packages are being marketed with the computer to doctors and health specialists of various types.

Agrinautics (Las Vegas, NV) has a set of packages for those who spray agricultural products. The user enters such items as distance to be traveled to a work site, speed and various parameters about the size of the site and the task to be accomplished. The computer outputs a "best procedure" and other factors. In short, a plane or other vehicle can be

loaded with a certainty of costs and profits, not easily obtained without a computer. The programs have been used for some time on programmable calculators and small micros.

* * * * *

Let's consider a high-powered application of differential equations. Suppose a diesel electric train is to be stopped using air and dynamic braking. To avoid overloading the generator, dynamic braking will be limited by automatically adjusting horsepower at 75% of capacity. Although braking is a function of the coefficient of friction between the wheels and rails, hold this constant. Then the de-acceleration or retardation rate is B = 2.93 ft/sec^2. The acceleration can be written as A = B+C/V, where C is a constant equal to (–550) times the horsepower (14100) times the force due to gravity divided by the weight of the train (3.57E6 lbs). With these values, C = 69.88. Essentially, C converts the reciprocal velocity to acceleration.

As the train slows down, there's a point at which the generator is unable to dissipate horsepower in the resistance grid. At this point, about 33.7 ft/sec, the force falls off linearly according to A = B+C*(D*V+E), where D and E are constants. Finally, at about 7.33 seconds, a better form is A = B+.00356*C*V.

This information and the following program are courtesy of Philip Wessels, Diamond Bar, CA. He has pointed out that the practice of solving such equations on computers is well established. But until the advent of pocket computers, a computer was not always available and often expensive or inconvenient to use. Having struggled mightily to solve such equations myself, I heartily approve of Mr. Wessels approach. For a more complete treatment of this topic, send me a stamped envelope c/o the magazine and I'll forward a copy of Mr. Wessels' material.

I have modified Mr. Wessels' program slightly to fit the format of this column. The program uses Euler's method. The error estimated is a good measure of accuracy, which can be shown by comparing results to those derived by other methods. □

Sample results

TIME	DISP	VEL	ERR
2.00	144.028	69.086	.020
3.00	211.114	65.115	.039
4.00	274.196	61.078	.060
5.00	333.203	56.964	.080
6.00	388.052	52.760	.101
7.00	438.645	48.449	.123
8.00	484.864	44.008	.145
9.00	526.561	39.402	.168
10.00	563.549	34.582	.192
11.00	595.614	29.601	.217
12.00	622.717	24.661	.242
13.00	644.902	19.767	.266
14.00	662.217	14.919	.290
15.00	674.707	10.117	.314
16.00	682.431	5.452	.338
17.00	685.886	1.653	.357
17.53	686.304	-0.008	.365

Program listing

```
 10: PRINT "TRAIN"
     - Initial velocity.
 20: V=73
     - Initial displacement, T=1 sec
 30: S=73
     - Retardation from air brakes.
 40: B=2.93
     - Converts reciprocal velocity
       to acceleration.
 50: C=69.88
     - Reaction + mechanical time.
 60: T=1
     - Constants, linear retardation.
 70: D=.000135: E=.0251
     - Time increment.
 80: U=.01
     - Set sum of errors.
 90: F=0
     - Count steps.  Output on 100.
100: N=0
     - Here for non-linear form.
110: IF V >33.7 LET A=B+C/V:GOTO 140
     - Here if less than 33.7 ft/sec
120: IF V >7.33 LET A=B+C*(D*V+E):
        GO TO 140
     - Here if less than 7.33 ft/sec
130: A=B+.00356*C*V
     - Decrease velocity.
140: V=V-A*U
     - Find and accumulate error.
150: F=F+A*U*U/2
     - Find new displacement.
160: S=S+V*U
     - Increase time.
170: T=T+U
     - Exit on zero velocity.
180: IF V<0 THEN 210
     - Count.  Can delete display.
190: N=N+1: PAUSE "T=";T
     - Display on 100.
200: IF N<100 THEN 110
     - Display results on seconds.
210: BEEP 1: Z=S: GO SUB 260
       PRINT "T=";T;" DISP=";Z
220: Z=V: GO SUB 260: Y=Z: Z=F: GO
       SUB 260: PRINT "V=";Y;"E=";Z
240: IF V>0 THEN 100
250: BEEP 3: PRINT "DONE": STOP
260: Z=INT(Z*1000+.5)/1000: RETURN
270: END
```

Houston Instrument's Hi Plot DMP-7 Plotter

The Plot Thickens

by Roger H. Edelson

The Houston Instrument (Austin, TX) line of digital plotters brings the hard-copy preparation of charts and graphs into the reach of the personal computer enthusiast and the small businessman, while maintaining a friendly software environment. Ranging in price from $1,085 for the 8½ by 11 in. (DIN A4) DMP-2 to $1,985 for the DMP-7, the Hiplot line provides a plotter to fill almost any requirement. The top-of-the-line item—the DMP-7—provides an 11 by 17 inch plotting surface, internal microprocessor intelligence, and a vacuum paper hold-down.

The differences between the various plotters exist in the provision of intelligence, plot area, paper hold down technique, and front panel vs. remote positioning of the X and Y axes. Neither the DMP-2 nor DMP-5 possess an internal microprocessor, with the DMP-5 providing the larger plot size. The DMP-4 and DMP-7 both provide full front panel electronic controls for X and Y axis positioning, an internal microprocessor to allow use of the simple DM/PL plot language. They differ in that the DMP-7 provides the full 11 by 17 surface with the vacuum hold-down, and the electronic controls may be detached and repositioned for customized mounting applications. The 8½ by 11-in. plotters use a simple mechanical clip design controlled by a convenient slide. Both hold-down techniques are UL compatible, with the entire line being UL-listed.

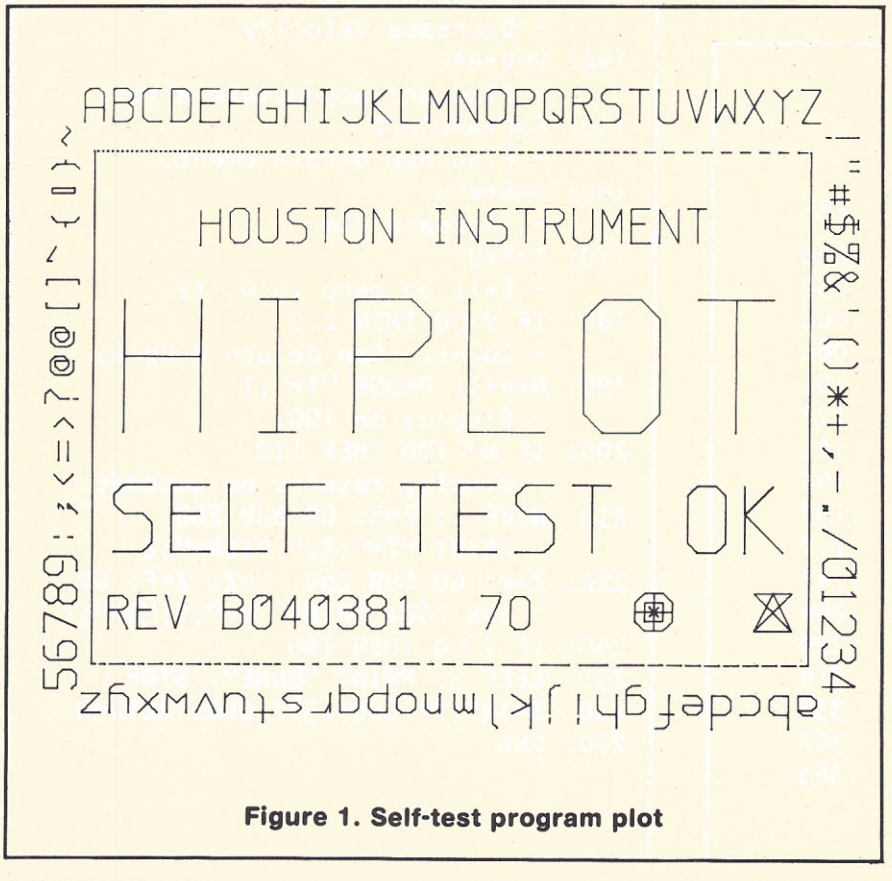


Figure 1. Self-test program plot

Plotter's capabilities

Let's consider the common characteristics and capabilities of the entire Hi Plot line. Standard on all models are a serial RS-232C (almost) protocol and a parallel, Centronics compatible interface. All models of plotter provide the capability to accept a six-pen option, which allows automatic selection (under program control) of the desired pen color when producing multi-color graphs and drawings. The pens come in standard black, red, blue, green, violet, orange and an optional brown. This multi-pen option is user retrofitable on all but the DMP-5, -6 and -7 (the 11 by 17-in. plotters) and costs only $395. For the larger plotters, the factory will install this option for an additional $100; the

difference stems from the method of mounting the pen used in the different models.

Although the DMP-2 and -5 models do not feature intelligence, this does not mean that they are not viable alternatives. They may be the most cost effective device for a particular application. There are a number of commercially available programs for use with these two models, which allow the production of precise, top-quality graphs and plots. One notable effort is produced by West Coast Consultants, Tracy, CA. However, the addition of intelligence to the models DMP-3, -4, -6 and -7 through the inclusion of a Z80 CPU minimizes the amount of software required to generate a data plot and allows the plotter to appear friendly to the user.

All the models provide dual resolutions (with the exception of the DMP-2, which provides only the larger step size) of both 0.01 in. (0.2 mm) and 0.005 in. (0.1 mm) with a plot speed of between 2.4 in./sec. (~48 cm/sec.) and 3 in./sec. (60 mm/sec.). All models provide remote control of the X and Y axes, while the DMP-4 and -7 also allow local control of the plotter. With these two plotters, the self-test program may also be accessed from a local control panel. The self-test plot shown in figure 1 was obtained with the DMP-7 by simultaneously depressing the left and right arrow keys on the control panel. Note that the test pattern displays all the characters, symbols and line types available with the DM/PL language; figure 2 shows the DM/PL character set in its entirety. This test pattern was obtained without even having the plotter connected to the computer.

Because the serial interface does not conform to RS-232C standards, it is necessary to construct a special cable to operate the plotter. The appropriate cable may also be obtained from the company if desired. Interfacing information (and even the appropriate cable) are also provided for other computer protocols, supporting Pet, TRS-80, Apple and Atari. Though not standard, the RS-232 interface provides some novel features—the serial data transmission baud rate is selectable through this connector by the appropriate jumper connection. Also, the connector jumpering allows the user to select the handshaking protocol from the outside.

Let's consider the two hardwire selectable modes provided by the DM/PL language. The intelligent Hi Plot models provide these protocols, rather than simply implementing the DSR/CTS protocol developed for the asynchronous RS-232 port. In model one, XON/XOFF (cntrl-S/ cntrl-Q) protocol is used to indicate buffer-full and printer-ready conditions. As many microprocessors do not support this teletype derived protocol, the company has provided a second mode.

Buffer status indicated

Mode two (figure 3), allows the user more flexibility, in that handshaking may be implemented through program control and need not be restricted to XON/XOFF. In this mode, a user defined prompt code (usually a carriage return) is used to request the status of the plotter buffer at appropriate intervals.

Communicating with the intelligent Hi Plot models is quite easy in that the plot codes used in DM/PL consist solely of single ASCII characters. Plot command instructions may consist of a single character, or a single character followed by additional information. Commands

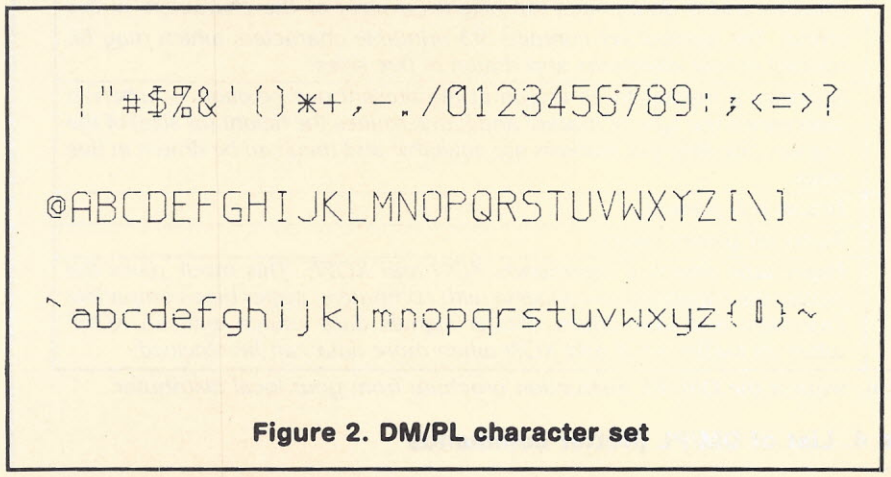
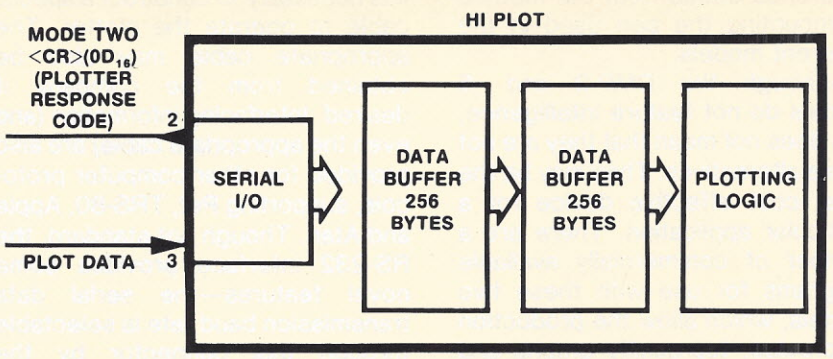


Figure 2. DM/PL character set

should be separated by a comma or a space. After the mode two protocol is established, the rest of the command drives the plotter pen to the lower left-hand corner (home position), calls the relative plot mode, places the pen on the paper, draws a line 600 steps in the +Y direction, then raises the pen.

Figure 4 provides a complete list of the plotter commands, providing a brief description and the command syntax arrangement. The ability to use relative and absolute coordinates when plotting, and to redefine the axes origin at any time under software control, provides a very powerful plotting language. The user need not feel restricted by the DM/PL line, symbol, and marker set, as it is possible to command the plotter to draw any conceivable figure through appropriate instructions. Once a particular figure has been defined, the plot commands can be stored as a subroutine to the main program, then called as required. The DM/PL language set allows the characters, or symbols, to be drawn in four different orientations, with twelve different sizes; the marker repertoire is limited to five different sizes.



WHEN 256 BYTES OF SPACE ARE AVAILABLE IN THE DATA BUFFER THE HI PLOT WAITS THE PROGRAMMED DELAY, THEN SENDS THE PROMPT CODE <CR>(0D$_{16}$) TO THE HOST COMPUTER.

Figure 3. Mode Two

The plotter that we tested performed like a dream, it was quiet and reasonably fast, though falling somewhat short of the HP graphics plotters. The interface was quite easy to use, and once the protocols are understood, and observed, they do not get in the way of the plotting operation. We appreciate the front-panel controls provided for positioning the X and Y axes, but it is probable that an OEM would prefer the models that do not have these functions, thereby removing one more chance for an error by an unsophisticated user.

The company normally warrants the product line for 90 days, but a two-year extended warranty and repair plan is available for $95. With the inclusion of a built-in microprocessor, plotters now present a minimum software burden to the host computer and will find increasing usage in the presentation of data output. The Hi Plot line should be considered for any graphics output requirement. □

CODES (ASCII)	*COMMAND DESCRIPTION*	*NOTES*
;:	*Plotter select*	*Plotter ignores everything until ;: is received*
O	*Origin*	*Defines present PEN position as the origin*
D	*Pen Down*	*Puts pen down*
U	*Pen Up*	*Picks pen up*
H	*Pen Up & Home*	*Picks pen up and moves it to lower left corner*
A xxxx,yyyy	*Absolute Coordinate*	*Moves pen to absolute coordinate xxxx,yyyy – – (range = –3999 to +3999)*
R xxxx,yyyy	*Relative Coordinate*	*Moves pen to relative coordinate xxxx,yyyy based on current pen position – – (range = –3999 to +3999)*
Ln	*Line Type*	*Specifies desired line type. Nine different dash line types available — L0 through L8. Defaults to L0 or solid line.*
*Srh string_*	*Symbol Mode Select*	*Specifies the symbol "string" to be plotted — where r determines the rotation and h determines the height (or size) of the characters in the string. The symbol set contains 93 printable characters which may be rotated in four directions and drawn in five sizes.*
Mnh	*Centered Marker*	*Specifies a marker to be drawn at the present pen position — where n determines the type of marker and h determines the height (or size) of the marker. Six different markers are available and they can be drawn in five sizes.*
T	*Test*	*Draws test pattern*
@	*Deselect*	*Turns off plotter select*
DC1,DC2	*XOFF,XON*	*Paper tape protocol commands XON and XOFF. This mode gives the plotter the capability to converse with computers, paper tape compatible cassettes, and disk drives. Plotter signals data source with an XOFF when its buffer is full and XON when more data can be received.*

COMMENT: *For additional information, request the DM/PL instruction brochure from your local distributor.*

Figure 4. List of DM/PL plotter commands

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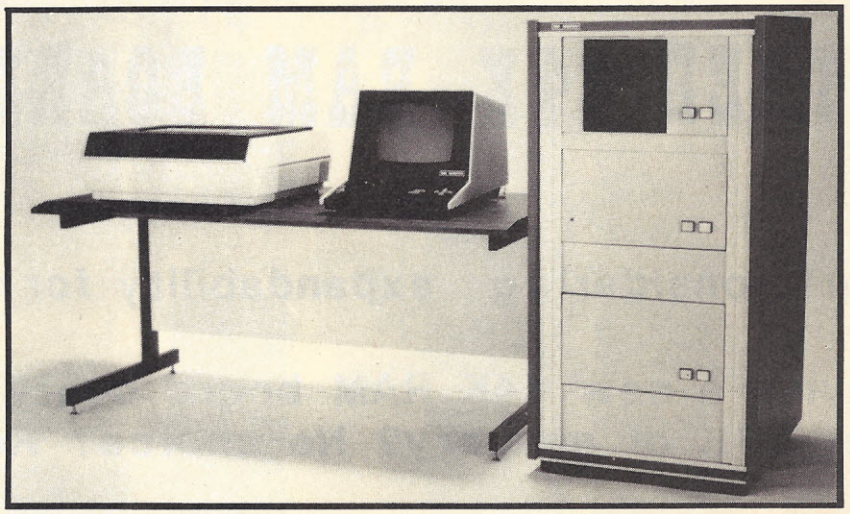
Ohio Scientific C3-A and C3-B



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Apple II Plus	6:17.4	$ 4,330
Radio Shack TRS-80 Model II	3:36.8**	$ 7,609
Pertec PC 2000	6:04.3	$12,470
DECstation 78	5:04.8*	$10,495
Vector Graphic System B	5:56.5	$ 8,995
Texas Instruments Model 771	3:38.1	$12,100
North Star Horizon	1:57.7	$ 6,911
Cromemco System Two	2:48.0	$ 9,275
Data General	*to be covered in future issues*	
Alpha Micro		

*Includes both compile and run time

**Program optimized by Radio Shack ran in 2:59.3

by Hillel Segal

Ohio Scientific, Aurora, OH, has gained a good reputation for providing reliable, low-cost hardware. However, the firm's software image has lagged behind, as the Association of Computer Users discovered in the user survey portion of our Benchmark Report. The benchmark tests are conducted by an independent consulting team. In this series of 12 systems priced under $15,000, the tests are run by the University of Colorado's Business Research Division. The full report covers two other real-life application benchmarks, speed tests of processor and disk operation, and runs that include the printer supplied with the system.

Ohio Scientific submitted two systems for testing. The C-3A includes two floppy disks for storage, and has 48K characters of memory. A Hazeltine display terminal (model 1420) and a line printer (Okidata 22) rounded out the system. The basic system, not including printer, costs $6,495 today, and the line printer adds $3,350, while the terminal is $1,095. The total price, as tested, would be $10,940, but less expensive printers are available.

The C3-B model comes with a hefty 74 million characters of storage on hard disk. It has more memory capacity and is $9,000 higher in price. Like the C-3A, it is built around the Challenger III processor system, which includes three microprocessors. The Basic interpreter uses a 6502A type processor, but 6800

and Z80 processors are also present. The three chips are software selectable, so the user could actually use different processors in the same program.

Ohio Scientific also offers intermediate systems with smaller hard disks. The C-3C has 23 million characters of storage, while the C-3D has 10 million.

Separate test runs were made for the floppy-based C-3A and hard disk-based C-3B. Naturally, the hard disk of the C3-B made it run faster on tests that use a lot of disk storage.

Several languges possible

The accounts receivable problem utilized in the benchmark test includes a mixture of arithmetic and disk storage/retrieval operations in a program simulating a typical accounting situation. The OS-65U operating system and Basic language were provided, and the program was installed on the system with some modifications as required. The file manipulation statements for opening, closing, input and output were adapted to OS Basic; these statements commonly differ among the various versions of the language. The output formatting to the screen or printer also needed modification, since the PRINT USING feature was not supported in this version.

The programs were not optimized by the manufacturer; in some cases, extra features of the language or computer can add to its speed, and we routinely extend an offer to the manufacturer to make any changes that would improve performance without changing the nature of the task. Assembly language programming, however, is not allowed.

The C-3A's time of 15 minutes, 49.3 seconds for the accounts receivable test was slower than expected. The C-3B showed more spark with its 4:16.9 performance, reflecting the faster disk access of the hard-surface disk. Both times, though, seemed to be affected by the operating system in use. The consultants' report stated: "These times...illustrate the rudimentary nature of the OS operating system. To make this faster would have required PEEKS and POKES, direct disk addressing, and I/O buffer management on the user's part."

Aside from the OS-65U, an OS-65D operating system is available, plus the popular CP/M operating system. In practice, users may prefer the more widely-known CP/M because of all the software that's available to run with it. We tested the OS operating system, since it is supplied with the computer package.

Various languages can be run on both systems, including Fortran, Cobol, Pascal and Basic. The company is increasing the number of software applications it offers, and compiling a directory of user-supplied programs.

Our survey of a small sample of Ohio Scientific users revealed widespread satisfaction with the hardware, but there was some criticism of the software, documentation and after-sale application support. When the survey was taken last year, the factory was unwilling to help with end users' software problems directly; dealers and OEMs were given the responsibility of supporting the user. This caused some frustration when questions came up that the dealers couldn't answer, and customers were adapting to the situation—or so they told us—by trying to become more self-reliant.

Since then, Ohio Scientific has come under the direction of M/A-COM, an electronics conglomerate, and has received new top management. The company has re-thought its end-user relationship, and is striving to improve its software image by providing more ready-to-run programs, better documentation, and more factory support.

These definitely seem like steps in the right direction. With equipment prices now a big factor in the market for small computers, dealers are finding their profit margins shrinking. That means that they can't afford a lot of after-sale help for the customer, and have to rely on the manufacturer to supply ready-made business programs and a high level of documentation.

Greater factory support, however, can also be expensive. Having already established itself as a provider of low-cost hardware, the company faces a great challenge in attempting to support the end user without raising prices—but this appears to be a real commitment. □

Hillel Segal is president of the Association of Computer Users, a non-profit association with members all over the U.S., Canada and several foreign countries.

One of the association's key activities is the publication of its Benchmark Reports. Each month a new report is produced covering a computer system.

In addition, ACU publishes seven bimonthly newsletters for users of small computers, midi computers, large computers, time-sharing systems, distributed processing systems, word processing systems and home and hobbyist computers.

A complete package of information about membership is available at P.O. Box 9003, Boulder, CO 80301.

System of the Month

Hewlett-Packard HP 125

by Tom Fox

The HP 125 from Hewlett-Packard, Cupertino, CA, comes in a visually appealing package. The system follows the current trend for squeezing a whole computer into the space previously reserved for just a terminal. The terminal is Hewlett-Packard's HP 2624 data entry device.

The basic terminal/computer unit comes in two pieces: a pedestal-mounted display screen and separate keyboard module. The screen sits on an unusually tall stalk, an oddity that takes some getting used to. A great many computer programs, however, write all their new information on the bottom line of the screen, scrolling the display as new information is shown. The high-in-the-saddle screen brings this bottom line closer to eye level, somewhat easing the S-curve sported by a lot of programmers' spines.

The cathode-ray tube (CRT) itself is a wide-bandwidth, high-resolution display that can contain 24 lines of 80 characters each. A 25th and 26th line are available as well, and are often used with the softkeys described below. Each character is formed by a 9 by 15 dot matrix cluster, contributing to a refreshingly sharp image. Character sets in English and six other languages are included at no extra charge.

The keyboard/display portion is equipped with its own independent Z80A microprocessor and a lot of other electronic help. The refresh memory is a generous 10K bytes, giving room for five separate pages of screen display. Each page is instantly accessible without bothering the system's main processor for attention. The independent display processor is equipped with its own complex set of programs, delivered as 32K bytes worth of read-only memory (ROM). All the visual attributes you can imagine (short of multi-colors) are managed by these programs: inverse video, full- and half-bright display, underlining, blinking and a limited graphics capability.

The keyboard is something special. It contains, of course, all the keys one would find on a typewriter. In addition, it includes a calculator-style 14-key pad for numeric entry, as well as a double row of special keys along the top. Most of the special keys have engraved "hard" functions, such as the four cursor-moving arrows and word processing tricks such as insert line, delete character, etc. Eight of the keys are called softkeys, whose functions can be assigned by the applications programmer. The softkeys and the two extra lines of display often work together; the display, in effect, writing computer-controlled legends on the keys themselves.

The electronics for this computer are contained on a single large circuit board. The board may be accessed by splitting the display screen housing and tipping it aside on a built-in hinge. The board is quite densely populated, as it contains two separate Z80A microprocessors and their supporting circuitry. Both of the 8-bit microprocessors, incidentally, operate at a speed of 3.68 MHz, just off the normally-seen 4 MHz rate seen on these units.

A full 64K bytes of user-available random-access memory (RAM) is installed in each system. This space must be shared among the operating system, applications program and user's data in the traditional manner.

Due to its heritage as a general-purpose data terminal, the flip of a switch is all that is needed to transform this computer into a simple data communications terminal. A pair of RS-232 communications interfaces come as standard, as do a current loop interface and HP-IB (IEEE-488) capability. The IEEE—488 bus is the means for communicating with most of the system's peripheral equipment (disk drives, printers and plotters). An extra-cost 300-baud modem is available for connection to your favorite timesharing service or public data bank.

This computer relies on a disk operating system, thus it needs a disk drive to become a whole computer. Only floppy drives are currently available, although Hewlett-Packard is sure to follow up with some sort of Winchester-technology hard disk hardware some time in the future.

For now, the major choice to make is between 5¼-in. minifloppy drives and standard-sized 8-in. floppies. The former can contain up to 256K bytes (characters) of data per drive; the latter, a full 1.2M bytes. From one to four of each kind of disk drive can be fitted. The disk

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drives come in boxy, metal-wrapped desktop enclosures that somehow lack the visual pizazz of the computer/terminal itself.

A rich selection of printer devices is available. Most unique is a thermal printer that fits inside the display screen enclosure itself. It is a relatively low-speed unit that rolls a printed image out the top of the enclosure. It appears as if there is some physical connection between what you see on the tube and the markings on the paper. The illusion is only due to the physical positioning of the screen and printer, however. A conventional serial thermal printhead actually does the work.

Next up the line is a low-cost dot-matrix impact printer. This is a variant of the Epson MX-80, fitted out in the shop with IEEE-488 interface electronics. Printing speed is 80 characters per second (cps), and a variety of printing options are available via software command.

Other printers include a pair of thermal units as well as a 180-cps unit for those voluminous reports. Finally, a private-labelled Xerox Diablo daisywheel word processing printer is offered. The latter unit can be fitted with either plastic or metal print wheels, and operates at up to 40 cps.

A unique offering from Hewlett-Packard is a pair of flat bed instrument quality plotters. These give the computer arms and hands for drawing pictures on a blank sheet of paper. There is a version that requires the user to exchange pens to alter colors and another, fancier one that will automatically grasp one of eight colored pens as needed to develop the picture.

All the system's software revolves around the CP/M operating system. To the end user, this means that the thousands of already-written CP/M-compatible programs can likely be made to work with the HP 125 and its young brothers. This simple fact may be all that is necessary to ensure the success of these systems. At the very least, it is sure to telescope the time delay needed before these machines are performing useful jobs for their buyers.

Among enhancements to CP/M, the HP 125's eight softkeys have been integrated into the disk directory in a clever and useful way. Insert a new diskette into the drive and execute a CP/M warm boot (by hitting control-C), and the bottom portion of the screen will light up with eight little boxes, each containing the name of an executable file on the diskette. Push the corresponding softkey just below any of these boxes, and the indicated program will begin to load and run instantly. It's a step beyond the familiar menu technique for handling such situations. First-time computer users will find it a lot handier than taking time out to comprehend the intricacies of disk directories and COM files.

Basic/125 is the only user-manipulatible language available from the manufacturer. (Of course, a host of different CP/M-compatible languages can be purchased from independent sources.) Basic/125 is a customized version of Microsoft's Basic-80 interpreter, version 5.2. Experienced micro programmers will be able to wallow around in a familiar environment here. Using our Prime Number Cruncher benchmark program (IA Aug 81), we saw this language perform right at 916 seconds—just a little better than average for Z80-equipped micros.

The company has selected the popular Spellbinder program as its system word processor. Here dubbed Word/125, the package was deemed by the selection

team to be superior to the even more popular WordStar offering. Word/125 includes all the necessary means to create, modify and print letters and documents. In addition, it features a built-in talent for merging form letters with mailing lists. When used with the daisywheel letter-quality printer, this program will produce true proportionally-spaced documents. A lot of today's word processors can't duplicate that trick, which involves making more room for "m"s than "i"s within each word on the page. Word/125 is a generous user of the HP 125's softkey capability, surely resulting in reduced training time for operators new to the world of word processing.

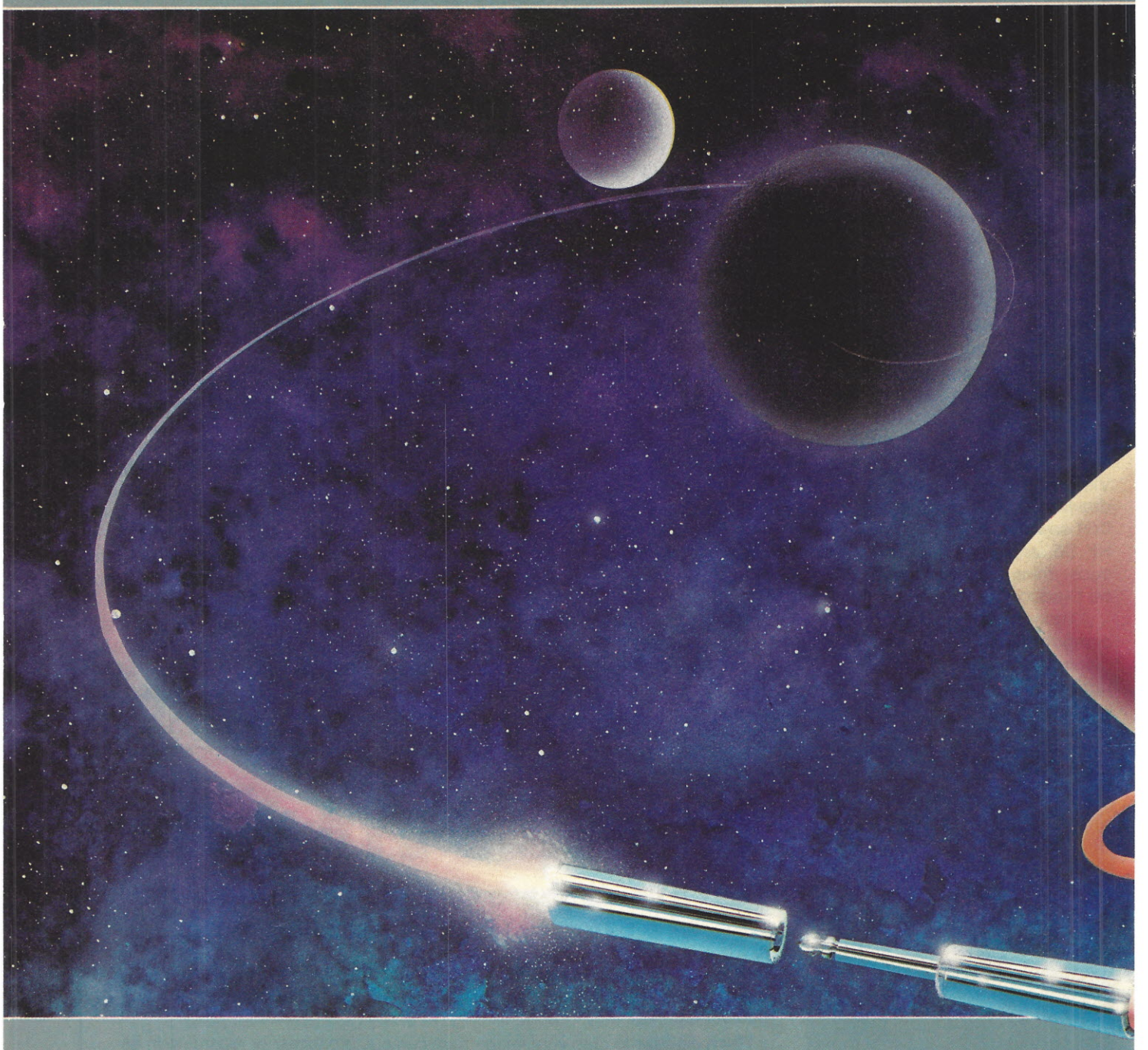
Popular programs

If Apple's experience is any guide, VisiCalc/125 is likely to become the most-used program in the HP 125's repertoire. VisiCalc is the friendly spread-sheet simulator that has found uses in a staggering variety of business, scientific and engineering applications. Hewlett-Packard has enhanced this version so that it is compatible with the graphics package. The results of VisiCalc sessions can thus be presented as machine-drawn multicolor graphs, bar charts and pie charts. We first saw the VisiCalc/graphics marriage in little brother HP 85, and were impressed with the ease with which such things as overhead projection masters could be produced.

Although VisiCalc/125 doesn't take advantage of the computer's softkeys, it uses all of the display's 80 columns of writing space. The program has been optimized for use with the high-speed display channel, which is a unique feature of the system. Since the screen display is equipped with its own Z80A chip, it is capable of displaying data at a much faster rate than the normally-seen 9600 baud rate. The two microprocessors communicate through RAM via a direct memory address (DMA) channel, rather than the normal serial path. The screen can be filled with characters in less than 0.2 seconds, at least ten times faster than what is possible with a normal serial terminal. This capability is critical to VisiCalc, whose usefulness depends heavily upon dynamically updated screen displays.

Two other packages round out the software catalog. One is the Graphics/125, which serves as a window into the world of flat bed pen plotters. The final offering is Link/125, which will be of interest only to owners of HP 3000 computer systems. Link/125 transforms the HP 125 into a *very* intelligent terminal to the larger computer system.

The basic unit lists for $3,750. The price includes the dual-processor terminal equipped with 64K bytes of RAM, as well as the RAM/ROM terminal support memory. Also included is the CP/M operating system. The computer is not complete, however, without adding at least one floppy diskette drive. Several are available, from a single 5¼-in. drive for $1,500 to a dual 8-in. setup for $6,830. Other peripherals include a built-in thermal printer for $1,210, the Epson dot matrix printer for $945, the daisywheel printer for $5,050 (with tractor feed), and graphics plotters at $3,274 and $5,374. A large collection of communications interfaces, modems and special-purpose printers are available as well. Software prices include Basic/125 for $325, VisiCalc/125 at $200, Word/125 for $500 and Graphics/125 listing at $200.□

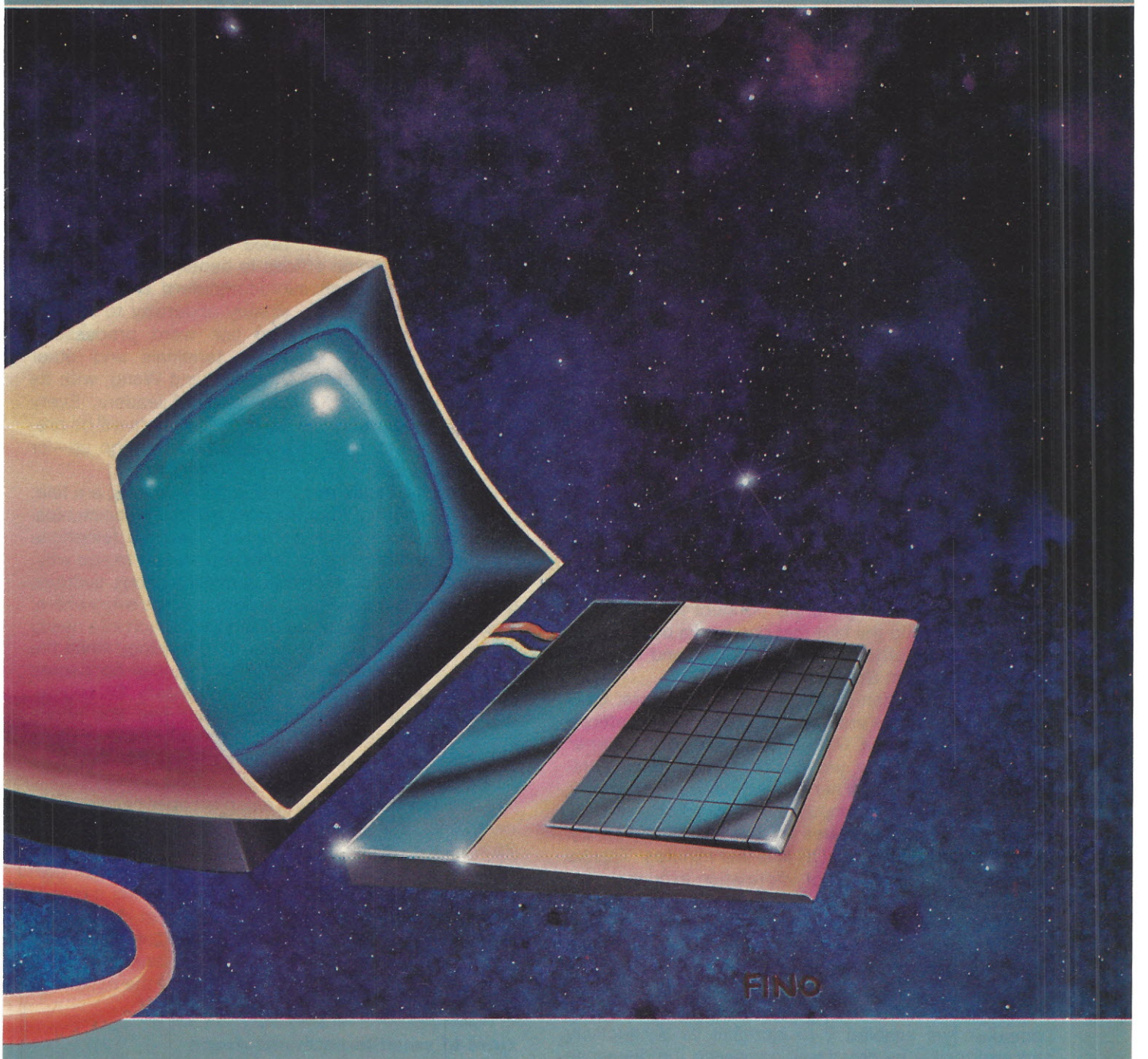


Linking Up for the Future – Microcomputers and Satellites

by David D. Busch

The home office, the hand-launched communications satellite and the death of cable television sound like fantasy today. But these factors are already reshaping small businesses as well as large. Following is a plausible scenario for the proliferation of the business microcomputer, based on many elements already in place.

There are several good reasons why micros will be adopted by business people many years before they become universal home appliances. The average American will tolerate a great deal less friendliness from a working tool. We may balk at learning how to program a microwave oven to defrost, cook and keep warm our meal. The average owner of a microprocessor-controlled video tape recorder rarely bothers to use all the features of the multi-day, multi-event, multi-channel



programmable timers. Yet, these same consumers don't flinch at learning to operate more complex microfilm retrieval systems or numeric controlled machinery at their jobs.

Micros will also flourish in the business environment because of their broad availability. The giants of the computer industry have finally recognized that someday every office will have some sort of data processing capability. While a company such as IBM will continue to earn its bread and butter selling microcomputers and large mainframes for the forseeable future, small users can frequently become large customers. By offering a variety of entry-level microcomputers in competition with the Apples and TRS-80s that have garnered most of the attention to date, the mainframe manufacturers can help assure themselves of a piece of the inevitable upward migration.

So a proliferation of micro choices, as well as a broader acceptance of the small computer as a working tool are almost foregone conclusions. As a business machine, the micro has nearly arrived.

While the very small business finds a great deal of use for micros in conducting general number and word crunching—general ledger, accounts payable/receivable, word processing—there are other applications. The micro offers the opportunity to reach beyond the confines of the business itself, and link into massive data bases, take orders from customers directly from their computers, or to market products to potential buyers without leaving one's own terminal. An intelligent

terminal—a microcomputer—will allow a great deal of flexibility for the businessperson of tomorrow.

That day lies not too far in the future. Creative Communications Services is an editorial firm that provides trade magazine articles for a number of blue chip clients. In a typical day, five to ten new assignments will arrive at the company's headquarters office in Encinitas, CA. One of the three account managers will review the project, make notations on coverage and story angle, and assign the job to a specific writer-photographer. Most of the time, the writer has the information in his hands the same day the assignment comes in. CCS has found that fast turnaround of projects encourages new work from clients, and improves cash flow measurably.

Because of this philosophy, the firm makes every effort to deliver work as soon as possible after it is completed. When a photojournalist finishes writing an assignment, it is edited for quality by a CCS editor that same day, typed, and sent to the client within 24 hours.

The micro's role

Where do microcomputers fit in, you ask? Probably the most unusual facet of CCS's operations is that all of this interchange of paperwork involves thousands of miles. The three managers of the company exchange memos, edit each other's copy, and that of the employees, scan financial reports, and generally conduct normal office business—despite the fact that one works out of Ohio, another has her office in North Carolina, and the third reports for work in Southern California.

With the exception of the main headquarters, CCS conducts its business entirely through one-person offices scattered across the U.S. Each writer-photographer works out of his home, yet is in constant telecommunications contact with the nerve center through a network of telephones, microcomputers and word processors.

Though one manager lives in Ohio, he can send copy to the office in Portland, OR in a few minutes. Thanks to a reasonable standard of information exchange, his TRS-80 model I can communicate with the Zenith microcomputer operated by the writer there. The same magic is performed between the other offices, equipped with word processing machines that double as microcomputers through CP/M operating systems.

Though CCS is a very small company, the microcomputer has enabled it to increase its productivity and profitability by drastically narrowing the distances between offices. In effect, it has consolidated operations into one large, extended office. Most of its staff works at home, but the effect is very much like dealing with co-workers in another part of a single, large office building.

The benefits are many. Only one office facility, with clerical help, accountants, word processing operators and other overhead has to be maintained. Each writer sets aside part of his home as an office, and is able to take a tax deduction on those expenses. Commuting time involves a walk from the kitchen to the spare room. Work time may be spread out over the day or evening, as needed, and those calling from different time zones needn't worry that the writer has fled the office at ten minutes before five.

CCS had embraced the home office concept even before it purchased its microcomputer/word processors. Telecommunications only made the system work efficiently. Previously, because account managers had to review each project before it went to the computer, it commonly took two weeks to deliver work after a writer had finished it. Four or five working days were wasted mailing the rough copy across the country, then an equal time expended sending it to the California main office for finish typing.

At 18% annual interest rates, that two weeks' extra delay built into the cash flow per project translates into a real cost of several thousand dollars annually to a company the size of CCS.

A company does not need to rely on employees working out of home offices to benefit from linking its various sites through microcomputers and telecommunications. Efforts are already underway to make it possible for businesses to link word processors, intelligent copiers, executive terminals and other devices. Xerox, with its Ethernet, and Wang, with its broadband Wangnet, are the current leaders. Every office building erected in the next few years will be prewired for systems of this sort when they go up—or they should be.

Personally, I think that wires within a building are fine, but not such a hot idea for inter-edificiary communication. We need to look no farther than the telephone company and local cable television station to see why.

To effect really efficient communications systems using wires, it is necessary to run the wires everywhere. The telephone companies of the U.S. reach into nearly every home already, but present technology limits the amount and kinds of information that can be carried over the already burdened phone system. Of course, telephone service necessarily must use the phone lines only for the last few miles to your home or place of business. Other technologies can carry the messages from town to town or country to country.

Cable television offers a much broader bandwidth to carry data, but service is currently available to only 25% of the homes in the U.S., and many of these are densely packed urban areas. In big cities, it can cost many thousands of dollars per mile to string cable. In rural and suburban areas, the lower cost is offset by the lower return from more sparsely populated customer bases. Given other developments, it seems unlikely that television cable service will blanket the nation any time soon.

Cost of satellite antennas drops

The television cable may already be on the way out. The FCC has given approval for direct-to-home satellite television transmission. The cost of satellite antennas has already dropped below $5,000 for some do-it-yourself models. Given the powerful incentive of 100 million or more customers, it seems likely that cheap low noise amplifiers, bargain-basement dishes and the $100 satellite antenna are only a few years of research and development away. By the end of the decade, rooftop home earth stations may be as common as the television antenna is today.

But the medium to small businesses may beat that deadline by four or five years. My home town has a population of just 13,000 people, but if I care to take a five minute drive, I can look at three or four satellite dishes. The most recently installed dish enables our local newspaper to pick up its UPI news more reliably

Continued on page 140

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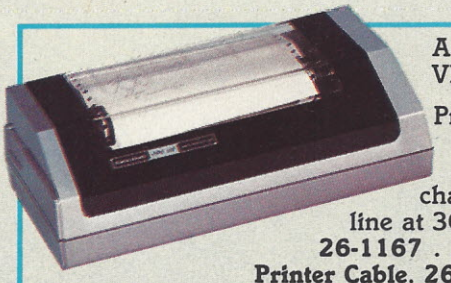

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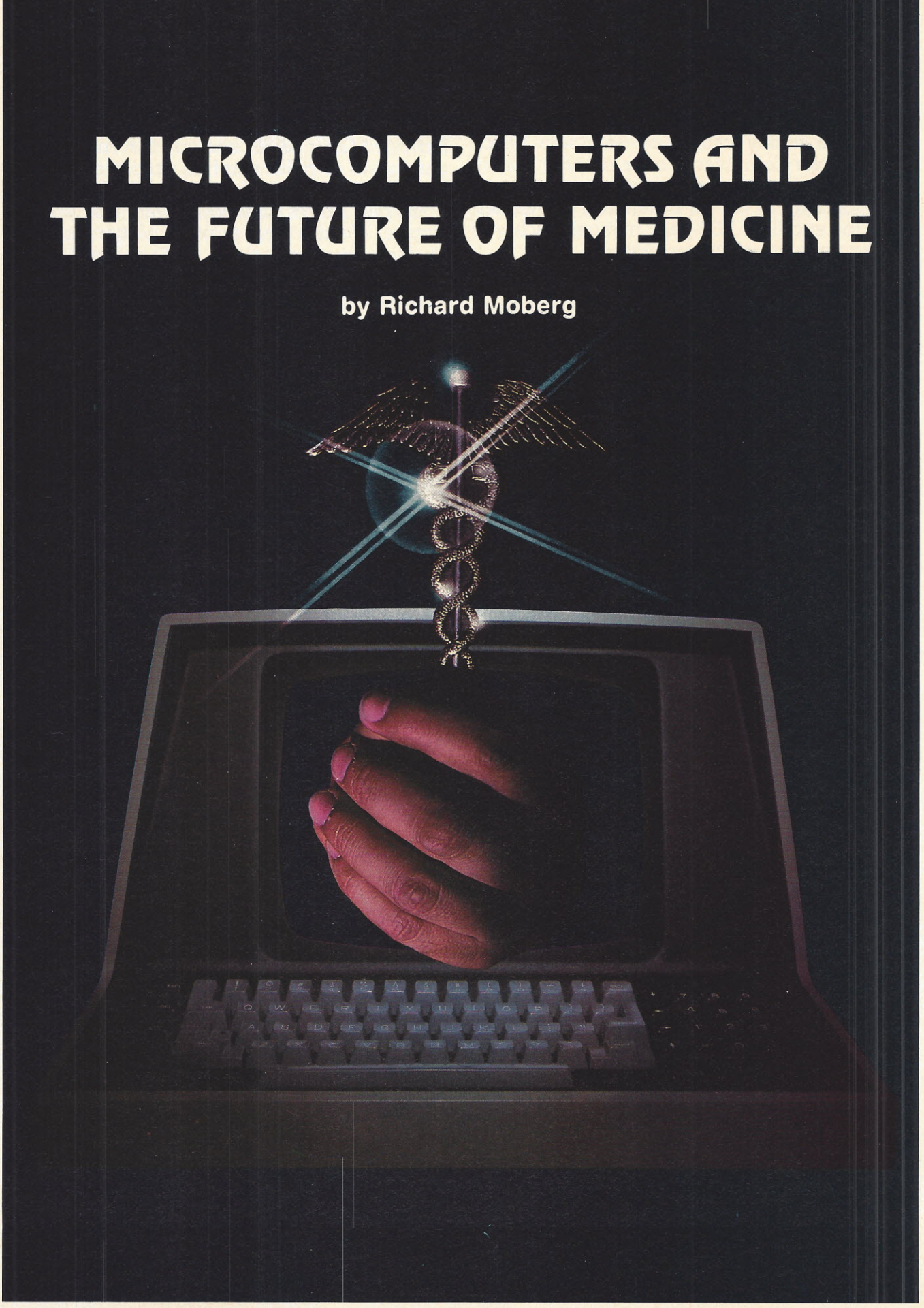
MICROCOMPUTERS AND THE FUTURE OF MEDICINE

by Richard Moberg



Will a computer ever replace a doctor? Many people wonder about this, but it seems to be the wrong question to ask. We should be wondering how medicine will be changed by computers, for computers and doctors will take on entirely new roles in the medicine of the near future.

A recent survey indicates that close to 20% of all physicians in the U.S. use computers in their practice. Another 4% are considering doing so. About 20% of those using computers own them; the rest rent or use a service bureau. Radiologists use computers twice as often as the other specialties and the most common use is for financial management.

Let's look at a sampling of current medical applications. The head of the family medicine department at Eastern Virginia Medical School, wears many hats in his day to day routine with responsibilities in public health, preventive medicine, medical school training and a residency program. He also writes questions for board examinations in preventive medicine. A TRS-80 computer system helps him abstract and file pertinent journal articles, write his own articles and books, prepare the exam questions, and devise student seminars and classes.

Another important use of small computers is to function as a data and procedure organizer, making sure details are not omitted in patient care plans. At Parklawn Memorial Hospital in Fort Wayne, IN, Dr. John Stanford has programmed an Apple II microcomputer to help with diagnoses in the Intensive Care Unit. The computer will give indications of cardiac function from data obtained from a catheter inserted into a pulmonary artery. These cardiac indices aid in treating patients with recent heart attacks or other cardiovascular problems. Programs have been written to analyze data from blood tests and breathing tests, search the medical literature for facts pertinent to a particular patient's problem and aid in medical education.

At the Rehabilitation Institute in Pittsburgh, PA, Dr. Friedman has developed a microcomputer system for the non-vocal handicapped. Using an Aim-65 microcomputer, a TV camera, and some other hardware, he can track the eyes of a person unable to speak. As they look at words displayed in front of them, the computer will speak to them. His device was awarded one of the top prizes in the Personal Computers to Aid the Handicapped contest sponsored by the National Science Foundation and Tandy Corp. This contest was a national search for such devices and the results have already greatly advanced the merger of microcomputers and medicine.

In the Neurosurgical Laboratories of Jefferson University, Philadelphia, PA, an Apple computer automates experiments aimed at an eventual understanding of the events leading up to a stroke. Also at Jefferson, medical students are writing programs that help explain medical concepts to their fellow students.

Microcomputers are also making inroads into the often staid realm of medical education. Dr. Gordon Banks has written a program for teaching neurological diagnosis. In one section, the program displays a diagram of a selected patient's face. Simulated lights can be directed into the eyes, and the pupil's response is noted by the student. It is all done with the Apple computer's high resolution graphics. At the end, it asks for a diagnosis based on the findings.

David Hon, of the American Heart Assoc., has put together a very impressive example of computer-aided teaching of a medical procedure. The subject is Cardiopulmonary Resuscitation (CPR) and the equipment consists of an Apple computer, a videodisc player and an automated CPR training manikin. The videodisc player allows random access of video segments and voice tracks, the automated manikin can sense whether the trainee is doing the procedure correctly or not, and the microcomputer controls the whole show. The three pieces of equipment provide a very effective alternative to individualized training at a reduced cost.

From these examples, we can look at the resulting trends in order to predict what the future has in store. The increased access to information is probably the most important support microcomputers will provide for medicine. Yet, hospital information systems have been slow to enter the medical establishments, partially due to the doctors' unwillingness to use them in their practices. The utility of small computer systems in related areas should certainly stimulate the doctor's interest in the further use of computers, and hopefully will ease the entrance of large medical information systems.

These systems will not be exclusively used in the hospital setting. Home access to medical information is also imminent. First aid, poison treatments, and programs that can perform simple diagnoses to tell if a person needs further attention by a specialist are in development. Future extensions of this will help to bring the emphasis on health care back to the individual.

Tiny monitoring devices

The micro-miniaturization of monitoring devices will continue to the point of the "personal medical monitor," which will be worn as a wrist watch, bracelet, neck pendant, or eye glasses depending on the parameters to be monitored. Digital signal processing chips will play an important part in this development. Problems with this technology deal with the reliability of long-term electrode designs and with artifact rejection techniques.

Instead of pen lights and stethoscopes, doctors in the next few years will carry portable diagnostic aides similar to today's calculators. Physiological signals as well as numerical data will be entered to give the doctor a quicker, more comprehensive evaluation of the patient.

The eventual success of the implantable microprocessor-controlled artificial pancreas will blaze the trail for other intelligent artificial organs. Small implanted micropumps controlled by microprocessors will make drug therapy or biochemical replacement therapy (proteins, enzymes, etc.) infinitely more accurate. Again, it is not the computer technology that is the limiting factor in this area, but rather that of sensors for the biological constituents needed to be monitored.

With microcomputer-based diagnostic instrumentation increasing in sophistication, we can expect these devices to soon be capable of making some of the judgements the physician now decides. For example, in cases where time is critical, the device could modify the delivery of a drug in response to the needs of the patient. Using such devices would raise such questions as: what the reliability of such a device is; where the responsibility lies should the device malfunction; and what the long-term consequences of using such a machine-controlled therapy are.

In 1979, the National Institutes of Health held a consensus development workshop, The Use of Microprocessor-Based Intelligent Machines in Patient Care. Questions such as these were discussed, and ethical and legal guidelines for this advancing technology were outlined. It was felt that these questions were not unique, and most of the issues had precedents in other medical devices. There was a general sense of urging the technology along, as most workshop attendees felt its benefits will far outweigh its problems.

Many of the new applications of microcomputers will be dealing with information display. Their increasing graphic capabilities will certainly have an impact. For example, a conventional brain wave display is difficult to interpret by hand, but when displayed as a frequency vs. amplitude plot, subtle changes can be seen. The decreasing cost of high quality computer graphics on small computers will significantly increase the information transfer rate from patient to physician.

The medical education of today is failing to train physicians to practice medicine with modern techniques. Emphasis is still placed on memorization—a losing battle when dealing with the exponential information increase of medicine. The skills common to all physicians need to be stressed in medical school. Data organization, data synthesis and decision making skills are what is needed. The computer must do the memorizing.

Teaching such skills can be a problem, but it need not be if newer computer-driven instructional methods are employed. The microcomputer and videodisc combination is a powerful tool for providing personal interactive teaching. Courseware is developed, using video and sound from the videodisc player, text and graphics from the computer, and an authoring language that combines all the material into a course—complete with exams and grading. Videodisc production costs will be decreasing soon, making this an excellent media for undergraduate and continuing medical education.

A personal computer is a powerful tool to collect and organize information. The author has used several of the currently available data base management programs to store medical facts that are traditionally memorized. Merely experimenting with these data while using the program gives one much of the familiarity needed to eventually use the material. In the future, medical students will be introduced to microcomputers early in their career.

The multi-tasking device

Today we see medical instrumentation in a divergent phase; that is, the number of different medical instruments is increasing. New devices to perform new tasks are constantly developed. But the same device will soon start to do more and more, until there is a minimum number of multifunctional instruments. For example, all electrical signals from the body (ECG, brain waves, etc.) will soon be collected and analyzed with the same hand-held device. Then, flip a switch, and the device is a miniature ultrasonic imager for looking inside the body. It is also a Doppler blood flow meter for checking the circulatory system, an audio analyzer for analyzing heart, lung and blood flow sounds and an infrared imager for detecting areas of decreased circulation and body temperature.

Current work in robotics and devices for the handicapped will lead to the development of quite an armamentarium of parts to replace those lost by accident and disease. Alternatively, these devices will be used to extend the normal capabilities of the body in strength, vision and hearing. Thus we will also arrive in the bionic age. Implantable devices will be around and fairly advanced, but many of the diseases for which we would use them today will by then be corrected by genetic engineering. Implanted devices, however, will serve as long term monitoring devices and perhaps will be used in more controversial ways, such as tracking prisoners allowed to leave their confines.

What about the doctor himself? Historically, medicine has been practiced by many different sections of the population, including priests, witch doctors, and barbers. Medicine will certainly outgrow the need for the physician as trained today and we will enter the next era of medicine, perhaps practiced by engineers. Engineers are taught today what the doctors of tomorrow will need: computer and information science, decision making, data analysis, etc. But how about that personal touch that is so necessary for medicine to be successful? Whether it is more effectively accomplished by a person or a machine is still being researched. I would opt for the machine. But one thing is certain: Today's physicians are not all equally gifted in the art of communicating with their patients.

It is clear that a team approach to medical problem solving is best. It is also clear that one of the team members must be a computer terminal connected to a medical data information network. Quick access to the patient's data and to the results of therapy of similar patients will be a necessity in the future practice of medicine. □

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USER-FRIENDLY LANGUAGES OF THE FUTURE

by Dorothy Kunkin Heller

Computer founders, like John Mauchly and Prosper Eckert of the Univac project, thought that only a few large computers used by a few highly-trained people, would ever be needed in the entire U.S. Early computer design, both of equipment and software, reflected this orientation—users of early DEC systems had to know binary in order to load a program! Complexity was acceptable, because computer users were expected to be as educated and technically sophisticated as the designer. Computer complexity also had the comfortable side-effect of increasing job security, making the few individuals who did understand computers more important. Now, a new cultural climate has evolved—the era of "friendly" computers.

As one Atari spokesperson recently commented: "We've already reached everyone who knows about computers. Now we've got to sell to all the people who don't." In order to accomplish this, computers must become more functional and easier to understand—friendlier.

"Designers must now think about saving time for people, not for the computer," states David Thornburg,

President of Innovision, Los Altos, CA. "Machine design and hook-up should be obvious and non-intimidating. Machines are here to serve people, not the other way around. The ultimate goal is control of the computer by the individual. The computer should be moldable by the end-user for any purpose he wants, including writing his own programs."

But in order for programming to become a more general activity, "...we need languages that mediate better between the computer's rigid numerical operation and human expression. High-level languages have rigid definitions, require much study on the part of the user and generally compromise in favor of the machine. In user-friendly languages, the user teaches the computer. In the future, languages will be judged by the extent to which they make sense to the naive user."

Don't worry about process

The watchword of user-friendly design is that "a good machine should be used and not heard...Individuals who use a dishwasher don't require documentation or have to worry about the *process* of using the dishwasher—it's an easy, functional tool," says Thornburg. "The promise is that computers are simple to use and easily achieve results with minimal effort on the part of the user. It really doesn't work that way yet."

Robert Kahn, Education Marketing Manager for Atari (Sunnyvale, CA), and Ted Kahn, Director of the Atari Institute for Educational Research and Action, agree that the user shouldn't have to be an artist to use graphics, a composer to use sound or need a knowledge of high-school algebra to program. What novice users need, they say, is a minimum of complications with simple syntax, commands and concepts. The first requirement of a user-friendly language is "commands that make intrinsic sense. It should be easy for the user to make the association between the format of the command and its purpose. What the command does should be obvious, not cryptic. If you have to type in a command like #PR7, it's not user-friendly."

"Even a statement like 'Ready' imposes unfair expectations on the user," says Thornburg. "Ready for what? It assumes that you know the computer is ready for input, and that you know how to load a program or enter data. This is just one example of telling the user to do what I mean, not what I say. Users can learn to cope with this kind of syntax, but why should they?"

"Interactivity is also very important," says Robert Kahn. "The ability to create modules or procedures as building blocks makes it possible for the user to experiment without ruining his whole program."

Two very different languages are now on the market that narrow the gap between the computer and the novice user: Logo, (developed at M.I.T. and promoted by Texas Instruments, Lubbock, TX), and Atari Pilot. Despite their many differences, both languages are designed to be user-friendly, appropriate for first-time users, including children. These languages also include Turtle Graphics, a programming tool originally developed at MIT for the Logo language.

Logo, its supporters claim, can make every child computer-literate comfortably and easily. "Logo offers a flexible vehicle to introduce children to programming, problem-solving and mathematics, including such sophisticated concepts as geometry, math-theory building, games, animation, variables, conditional logic and debugging. ...It puts programming, graphics and animation within the reach of every child."

"Logo was designed specifically for kids and educational applications," explains Daniel Watt, Research Associate in the MIT group. "It has no threshold and no ceiling—a five-year-old can program with Logo within his first few minutes at the computer, and a computer scientist can still take advantage of its very sophisticated capabilities."

One reason that Logo is so accessible to beginners is that the language is designed to be procedural. "You don't think of writing a program—you think of teaching the computer new commands with the commands it already knows." Once a child has written a procedure to draw a box on the screen, BOX becomes a command. Each child, in effect, creates his own private language. "This is the essence of Logo," says Ted Kahn.

The Turtle Graphics feature has recently received a great deal of publicity, due to Prof. Seymour Papert's book, *Mindstorms: Children, Computers, and Powerful Ideas*. Professor Papert, an MIT mathematician and educator, has led the Logo Development Group at M.I.T. for 11 years. He based the language on LISP, a programming language for artificial intelligence, and the educational theories of Jean Piaget.

Says M.I.T.'s Daniel Watt about Turtle Graphics: "Children are typically introduced to Logo by using the computer to control a turtle, an imaginary creature that lives on a graphics display screen. Commands typed at a keyboard control the turtle's movement (such as: FORWARD 100, BACK 50, RIGHT 90, LEFT 45). Drawing pictures with the turtle is an initial programming activity with immense resonance for most children. Children can identify with the turtle and imagine themselves going through its motions as it carries out a particular task. At the same time, controlling the turtle becomes a metaphor for controlling the computer itself."

The Logo Group believes that children should teach computers, rather than the computer programming the child. "In contrast, computer-aided instruction (CAI) uses teacher-oriented question-answer programs to drill the child, really to program him, instead of teaching him how to use the computer."

Pacing each child

Logo's flexibility enables each child to adapt it to his own learning style. Watt recently studied children using Logo in the Brookline, MA school system. "One student was a slow learner who had difficulty grasping concepts. Through trial and error, patience, and her own visual intuition, the student was able to successfully design and implement her project, creating a rich microworld that built on her limitations." A different student who was comfortable with theories, used an "advance-planning approach, creating structures to solve problems, and absorbing new strategies as he proceeded with the project." Both students were successful.

In Papert's book, he likens Turtle Graphics to working with an "electronic sketchpad, while learning a language for talking about shapes, fluxes of shapes, velocities, rates of change, processes and procedures. Children can learn to *speak* math, to see themselves as mathematicians."

An experimental Logo program, at the Lamplighter Elementary School in Dallas, TX uses the TI 99/4. This version of Logo offers sprites—special shapes the child

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CIRCLE INQUIRY NO. 8

creates that move on the video screen at a chosen rate of speed. The sprites can change shape as well as move, making it possible for young beginners to invent video games with animation. Lamplighter students consistently blow the curriculum when using Logo. One fourth-grade teacher estimated that her class would spend about two weeks on geometric forms before attempting to draw a circle. But within the first five minutes, her class had solved the problem through trial and error on the computer.

One of the advantages of Turtle Graphics, Thornburg explains, is that geometry becomes a living process. "Children can see that a shape is the trace of a process that takes place in nature. Even better, they can see objects that are the traces of a process they created and controlled."

"Computers are child magnets," Chris Morgan of *OnComputing* comments about the Lamplighter project. "They learn inductive and deductive reasoning while they program computers. Entire groups quickly interact and trade ideas. Logo language is particularly well-suited to the process of learning how to think because it's so easy to learn, yet rich in possibilities." Papert's real goal for Logo is to create "math-land"—a learning environment in which the computer is a catalyst for every child; fear of math disappears and students assimilate calculus and other math concepts naturally, easily and early.

"Logo is relatively expensive," states Dan Watt of M.I.T. "It requires a large system, and the schools resist the investment for young kids. For instance, Apple Logo requires the largest Apple, 64K RAM plus a memory card. TI's version of Logo also requires a memory add-on. This is because Logo is more comprehensive and has more capabilities than either Basic or Pilot. Logo is actually easier for both teacher and student, but until schools really understand the differences, they will continue to make decisions based on costs and sales promotion."

Some observers believe that TI Logo is that company's attempt to rescue its largely unsuccessful TI 99/4 personal computer. Although TI has lowered the price of the 99/4 and is experiencing improved sales, the hardware requirements for TI Logo may be daunting for beginning users and under-financed school systems. These requirements include the TI personal computer, color monitor or TV set with an RF modulator, the TI disk memory system and memory expansion unit. The package also contains the TI Logo solid state software command module, program diskette, initialized diskette and a user's manual.

The TI version does include many attractive features that reflect the flexibility of the Logo language. In M.I.T. and TI Logo implementations, the turtle is visible on the screen as a triangle. The user can see exactly where the turtle is and what direction it's facing. As the student types in the program for STAR; he sees the turtle's movements on the screen as the pattern is created.

The commands are fairly simple and straightforward, as: PENUP, PENDOWN, PENERASE, PENREVERSE. In addition to the sprites, the user can take advantage of Logo features such as recursion, which Papert describes as a "trick for setting up a never-ending process that allows the child to play with infinity." Recursion makes it possible for procedures to operate on themselves. In TI and M.I.T. Logo, local variables are also possible. "In Basic, if variable A is defined, it's defined for the whole program. In Logo, the variable can be local." Logo is extensible; the user can start with primitive commands and make up his own version of the language as he goes along. "Logo enables the user to build meta-tools, to define procedures and make more powerful tools."

An important feature of Logo (and to a more limited degree, Atari Pilot), explains Ted Kahn, is that "these languages encourage people to start writing programs immediately in small modular pieces. Basic only allows subroutines. It's important to give users tools to make their own building blocks."

Students exploring the possibilities of TI Logo

Logo's range is impressive. But will beginners and schools make the investment?

"Languages are implementation-dependent and fluid; it's not so much the language as the features," explains Thornburg. Atari Pilot, which differs both from Core Pilot and Apple's version of the language, is a good example that languages aren't always implemented the way they were designed.

"We decided that there are three types of beginners we need to reach," explains Robert Kahn. "The hardest audience to reach is elementary school teachers. They tend to have more fear about technology than either the children or the average consumer. The consumer audience is more function-oriented. They want the computer to perform specific functions for specific purposes. Many of these consumers are in transition from being entry-level users to discovering the joy of programming."

The third audience, children "can do anything and are afraid of nothing." However, Thornburg points out that "kids won't buy into the difficulty of using a machine. It's either relevant to their world or they won't bother. For the computer to be a useful tool for a child, the child has to make the decision that it's relevant. Conversely, adults are more ready to be intimidated. But any language or system that's good for kids is also good for adults."

Atari's answer was to create its own implementation of Pilot, adding the Turtle Graphics feature of Logo to its version of Core Pilot. The goal was to create a graphics and text tool that would be low-cost and run on a minimal configuration. "Pilot's simplicity is very important—people want simple things," states Ted Kahn.

Atari Pilot can run on a minimal 8K model 400. "Atari Pilot allows people at an elementary, rudimentary level to build tools and get quick, simple success with the computer, especially with manipulating text. Playing with words is just as important as playing with graphics," Ted Kahn emphasizes. "Pilot is more limited than Logo in some ways, but Pilot is actually better-suited to interactive story-telling and dialogue."

Pilot for teachers

Core Pilot was originally developed at the University of California, San Francisco by John Starkweather. Pilot (Programmed Inquiry, Learning or Teaching) was designed for the use of teachers and administrators in a time-sharing environment to do complicated string pattern matching in order to create curriculum materials and monitor test scores.

The Match and Type commands are the essence of Pilot. Type (T:) and Accept (A:) allow the computer to display and accept information without delimiters. Users don't need to type in quotation marks ("") or semicolons (;) as in Basic. The Match (M:) command matches the user's response to one or more answers expected by the program. Match automatically sets up a Yes or No condition—Yes (Y) there was a match, or No (N) there was no match.

Atari Pilot also includes modules. Users can label a short program, such as how to draw a star, and call up the module for later use. In a primitive form, the language enables the user to maintain a "library" of tools. The language sells for $90. The package includes the Pilot cartridge, three manuals, two tape cassettes and a pocket reference card.

"The real impact of Logo and Atari Pilot is that they are easy to learn and very powerful. They will become the languages of the mass market and replace Basic," states Thornburg. "Basic isn't easy to learn because it doesn't make sense. Any adult, in contrast, can write a simple filing or mailing program in Pilot."

Both Logo and Atari Pilot point the way towards new kinds of interaction with the computer. Some see Atari Pilot, Logo and Smalltalk (a language under development at Xerox Research Center, Palo Alto, CA) as a continuum in a trend towards more powerful, flexible, user-oriented languages. Research on computer use for the handicapped also presents alternatives to the standard QWERTY keyboard as the interface between user and computer. New interfaces may involve brain waves, galvanic muscular contractions and speech to communicate with the computer.

Adherents of both Logo and Atari Pilot hope that these languages will be a vehicle for new ways to learn. "There is tremendous educational value in letting children control the computer," says Thornburg. "Ultimately," Ted Kahn hopes, "computers will become a dynamic means of self-expression." Papert's dream is "to make science for the people" in a society where mathematics and scientific learning is natural and accessible to all. Of course, languages can't cause change in our educational environment; only people can. □

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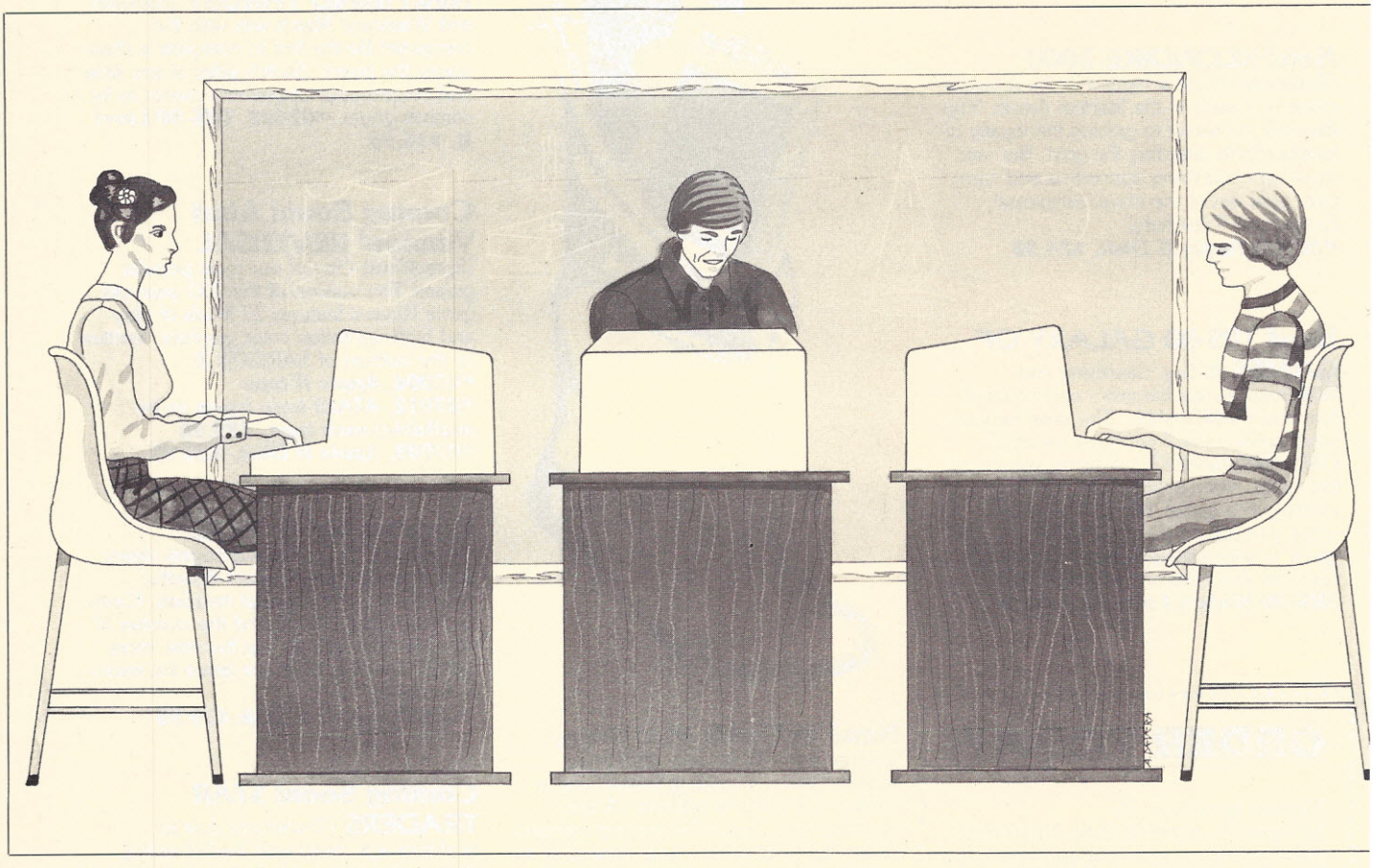


by Mary Ann Mogus

If developments occurring in microcomputer technology over the last five years are considered, the next two decades will offer an expansion and growth in hardware, software and interfacing techniques that will make our present systems obsolete. Microcomputers have the potential to alter what is meant by the term education.

Microcomputers are already present in the classroom, from kindergarten through college. Educational software is available for a variety of subjects and manufacturers of some of the better known microcomputers even supply funding for educational usage of computers. Also, software that enables teachers to write their own program lessons is available.

Most software makes limited use of microcomputer capabilities, especially those of graphics and interfacing. Topics and courses in the future will be developed especially to make use of these capabilities.

Interactions with the microcomputer are still at a primitive stage. Rote learning and drill, the teaching of simple factual concepts and simulations, make up the majority of the software. The work of investigators such as Seymour Papert show glimpses of a future where microcomputers teach people how to learn according to their individual abilities.

Micro for each student

Imagine a future classroom where students are each equipped with their own microcomputer. Students attend a lecture dealing with a physics topic. All microcomputers are networked with the teacher's. Not only is the material conveyed to the students by a simple lecture format; the lecture is also recorded by their microcomputers. Under supervision, the students interact with their microcomputers to solve problems dealing with the material presented in the lecture. The problems are presented by the individual microcomputers and transmitted along with the lecture. The students request clarification of points from the teacher while in class. The teacher also has a read-out from all student microcomputers and knows at the end of class how well students absorbed and understood the

material. Remedial work is inserted in the microcomputers for those who need it, with advanced material inserted for those who are ahead.

The added feature of computer graphics to give visual illustrations of the concepts will enhance student understanding of the material. The use of individual microcomputers, alone or networked, will permit students to manipulate laboratory equipment and work with concrete demonstrations of the material presented in class.

The individual microcomputer is not a fanciful idea, but one to which colleges have begun to commit themselves. Dartmouth has begun such a project and Carnegie-Melon University is considering it. Microcomputers are already available in sufficient numbers in elementary classrooms to be considered individual microcomputers for most students.

Nor will such uses be confined to the sciences. The arts, music and humanities will use microcomputers in classes. While word processors and text editors have obvious applications in English classes, such processors can be adapted to music composition. The composer can write, edit and listen to the composition. Granted, the music may not sound exactly the same when played on instruments. However, the immediate feedback will enable the composer to rewrite and change the composition with ease. The composer will be able to compose more in less time, just as writers using word processors can write more in less time.

Language education improved

Using the word processor with computer-aided translation will enhance the learning of foreign languages. Add to this a complex speech synthesizer and the student has an individual language tutor.

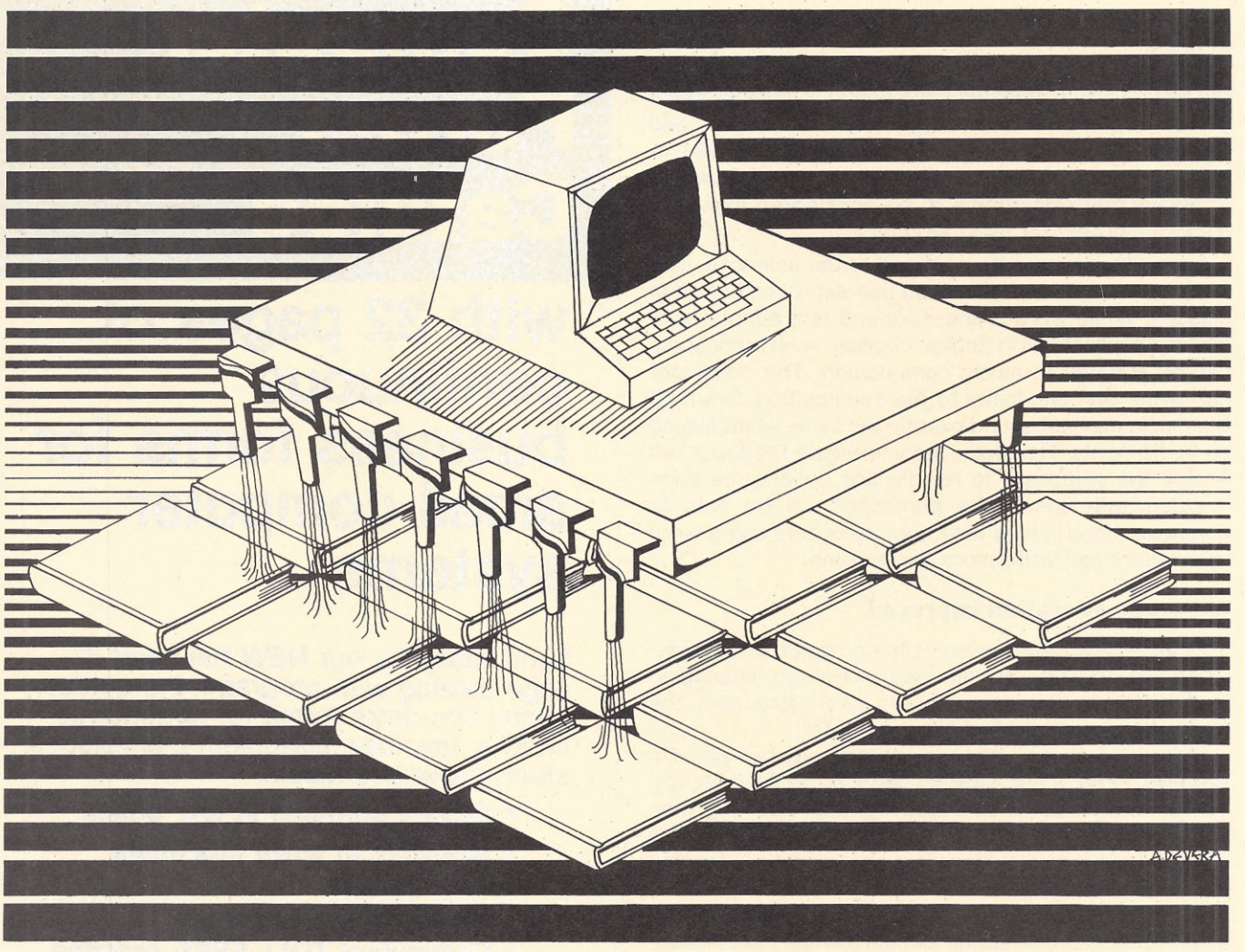
Unlike television, microcomputers are not passive systems. You must interact with a microcomputer. Therein lies its ability as a teaching tool. Learning is an active process requiring interaction. Students will grow more sensitive to a subject in a shorter time. Learning will become easier.

As such individualized instruction progresses, due to a growth in microcomputer capabilities and sophistication, schools will undergo a transformation. They will no longer be a place exclusively to learn, as this will take place in the home, library, workplace—any place where a microcomputer is available. Indeed, schools will make available microcomputers and standardized learning systems for those unable or unwilling to follow an external learning program. They will also serve as a clearing house for standarized testing to determine mastery of a subject or a course of study.

Extending our cognitive range means taking in vast quantities of information. Microcomputers perform this function with ease. Future microcomputers will be networked to large mainframe storge computers. Access to libraries of information will be available to anyone with a microcomputer and a telephone, or a direct cable link-up installed in most homes. Direct access to news, stock market reports, magazines, journals and other sources will connect people electronically.

This transition in learning and education will not come easily. People are still intimidated by microcomputers. Once a generation becomes used to the microcomputer and grows with it, changes will be forced to occur. That generation is only a decade away. □

THE PAPER CHASE MEETS THE CHIP



by Steven C. Gilyeart

The law is a paper chase. A typical portrait positions a lawyer or judge immediately before a solid wall of books as the symbol most descriptive of the profession. And indeed, every law office and courtroom in the country has hundreds of those lawbooks. The information stored therein is the crucial stock-in-trade of this country's law. The books tell the attorney what words to put in a will, what documents are needed to merge one corporation with another and what conduct will send a person to prison. Even in interpreting the information in one lawbook, another lawbook is used, and yet another may be used to further interpret that interpretation. And each interpretation generates more documents, more paper: contracts; letters; memoranda; briefs; papers starting lawsuits; papers foreclosing on a mortgage; papers demanding a divorce; papers asking for settlement of a claim. Then, the courthouse clerks must file those papers, messengers must hand-deliver them and the U.S. Postal Service must carry them. With every passing year, there are more laws, more lawbooks, more interpretations of the law, more lawsuits and more paper.

But there is hope; there is the chip. The microprocessor and its capabilities could revolutionize the manner in which legal services are provided to our society. It could affect not only the manner in which attorneys work and courts operate, but also the public's perception of the law.

To some extent, the electronic law office has already arrived. Legal research can be done at a terminal that accesses a database of cases, statutes and regulations. Word processing is used to speed the preparation of lengthy documents that undergo several revisions before reaching their final form. Word processors are also being used to keep track of files, maintain client lists and handle accounting functions. However, the potential for use of electronic information processing in the legal profession is much more pronounced.

Most electronic legal research is conducted via video display. The material from a case presented on the screen must then be printed or written out on paper.

But suppose a split-screen existed, such that an attorney could research the law on the left side of the screen, while composing his brief on the right. If he found a quote in a case to his liking, he would merely transfer it from the left side to the right, where it would become part of his developing brief. After having completed his draft, he would revise it on the screen; the only print-out would be the final document. The same process could be utilized in constructing a contract or any other legal document: reviewing possible contract clauses or provisions from the data base on the left side of the screen, selecting the desired provisions and transferring it to the right, where the draft contract is emerging.

At present, the customer preparation of a legal document involves numerous steps: the attorney, his associate or paralegal reviews the law in the applicable area, extracting relevant information; that material is then physically organized into a logical presentation; the text of the document is dictated therefrom; the dictation is then typed into a word processing unit; a draft is printed; the draft is returned to the attorney who marks up the hard copy with his revisions, or maybe even redictates part of the document; and finally, the document is returned to the word processor operator who revises the stored document. The last two steps may be repeated a number of times. Although dictation is generally six times faster than writing, some attorneys may not use dictation at any point in the project and may write everything out.

Compression is possible

There are numerous transcriptions and re-transcriptions in the above-described sequence. Electronic research coupled with simultaneous electronic composition will compress the numerous steps outlined above into a quick and efficient procedure far speedier (and therefore less expensive) than the traditional "book-paper-dictation-transcription" method.

The paper that has been generated travels, whether by the U.S. Postal Service or special messenger services. Whatever the method of transport, it is very much a "hands-on" process. As the cost of physically transporting items grows, the need for an electronic mail system will increase. However, due to the highly confidential nature of such correspondence or documents, the electronic industry will be challenged to develop foolproof safeguards to prevent unauthorized interception of such electronic communications before electronic mail can become a fully viable mode of operation in the legal profession.

Litigation on the upswing

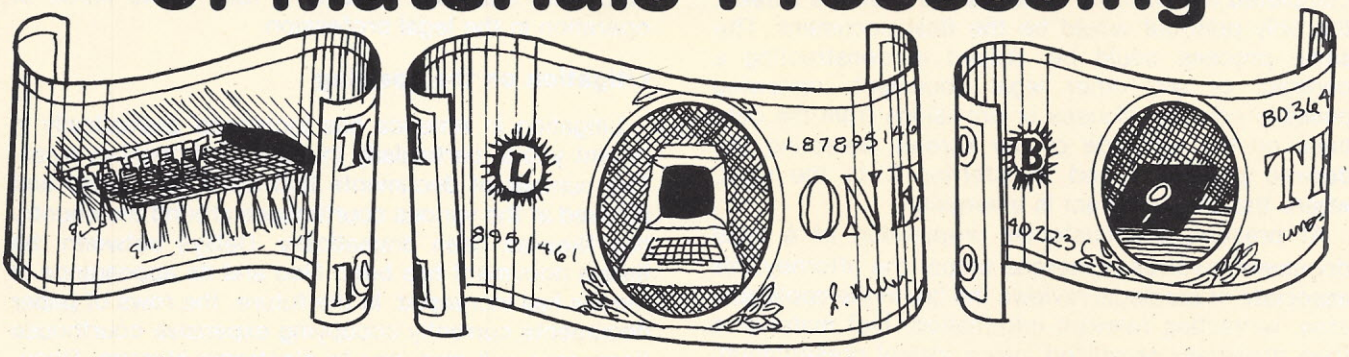
Litigation in America has increased dramatically in recent years, particularly in major metropolitan areas. The number of documents that are filed, sorted and indexed at the various courthouses around the country has likewise risen dramatically. Delays between the time a document has been filed and its appearance in the file has increased. In the future, the rows of paper documents currently occupying expensive courthouse floorspace will give way to electronic storage. Documents will no longer be physically filed. An attorney who has electronically composed his brief into its final form will hit a button, and via the electronic mail, it will be instantly filed in the courthouse computer system. Service of that document on all of the other attorneys in the case will likewise occur instantaneously over the electronic mail.

And of course, if an attorney wants to review documents previously filed at the courthouse, he can access them from his office terminal. No longer will it be necessary to travel to the courthouse to review a piece of paper manually retrieved by a clerk wandering among rows of files.

Similarly, every courtroom will be equipped with terminals to provide instant access to a case's record during the trial itself, as well as to allow the attorneys and the judge to do immediate research on any point of law at the time it's raised during the trial.

The above changes will not happen overnight. Some cannot occur until word processors or minicomputers appear in the majority of law offices. Yet, the economics of modern office management, including those applicable to law offices, seem destined to compel an expanding role for computer usage. □

DBMS for Bill of Materials Processing



by Rocky Smolin

In order to keep up with competitors and the increasing pressure of work flow efficiency, thousands of small business owners turn to computerization. It is not always a smooth transition, as Jim Hitchin, president of Thermal Energy Storage, Inc., of San Diego, CA, can attest to—but he now knows it is well worth the investment.

"We're a small company on limited capital resources. Yet our product, a system that stores the sun's heat in a salt solution, and releases it later as it is needed, is complex. So I'm faced with the usual manufacturing problems of engineering and document controls, inventory ordering and stocking information, product pricing, etc. As much as we might need it, however, we can't afford to invest in the hardware and software that would give us bill of materials processing capability," Hitchin claims.

Hitchin is no stranger to problem solving. Since its founding in 1978, he has brought the company to the point where it is not only building and delivering the energy storage unit, but has also incorporated a degree of computerization into the company's every-day operation.

In July 1980, TESI acquired a Radio Shack model II, a three drive expansion unit, and a Daisy Wheel II printer. The company purchased and implemented four of the Taranto software packages—general ledger, accounts payable, accounts receivable and payroll. "We had a hell of a time at first," Jim recalls, "but persistence paid off, and now we're doing all our accounting on the computer."

TESI also implemented: WordMagic, a word processing package from Data Strategies, VisiCalc from Personal Software and Mail List System from Radio Shack.

"We have about $8,000 invested in the hardware and $4,000 in the software. Getting this equipment was one of the best decisions we ever made, and now being able to use it for our bills of material, however rudimentary it may be, only confirms my belief that small computers can be of material benefit to small businesses."

TESI's bill of materials processor is more than a rudimentary tool. It is built around Radio Shack's Profile II, a computerized filing system wherein the user can define records such as names, addresses and personnel information. The package has up to 99 fields in the record and stores up to 3,000 of these individual records on a single disk. It also allows the user to recall these records by specifying any of up to 36 fields, using relational operators (>, <, =, etc.). The user may sort and report the results of the retrievals in different formats.

The most obvious problem for TESI was to record in a controlled way a bill of materials, meaning a list of all

```
                    D E F I N E   F I L E   F O R M A T S

 Field Number          - Field Heading -          Field Length

      01          PART NUMBER                        00011
      02          GROUP NUMBER                       00001
      03          INDENT GROUP                       00001
      04          CONTROL NUMBER & INDENTED P/N      00024
      05          DESCRIPTION                        00030
      06          QUANTITY PER ASSY                  00004
      07          UNIT COST                          00007
      08          EXTENDED COST                      00007

                          > Enter Selection

Press  H  To Hardcopy,  R  To Replace,  BREAK  To Exit Or  N  Next Segment
```

Figure 1. Defining the record

MASTER BILL OF MATERIALS
Thu Aug 13 1981

REC NO	PART NUMBER	GRP NO	IND NO	CONTROL/ NUMBER/	INDENTED PART NO	DESCRIPTION	QTY PER	UNIT COST	EXTEND COST	NOTES
00001	260-0001-6	0	0	00000	260-0001-6	Storage Tank Assy, Mod VI	1.			
00002	901-0050	0	6	00100	901-0050	Screw SckthdCp SS 10-32 x 5/8	24.	.10	2.40	
00003	901-0071	0	6	00200	901-0071	Bolt HxHd SS 1/4-20 x 3/4	4.	.09	.36	
00004	901-1016	0	6	00300	901-1016	Nut Hx SS 1/4-20	34.	.04	1.36	
00005	901-0074	0	6	00400	901-0074	Bolt HxHd PLTD 1/4-20 x 1 1/4	34.	.04	1.36	
00006	901-2018	0	6	00500	901-2018	Washer Flt SS 1/4	40.	.03	1.20	
00007	901-2012	0	6	00600	901-2012	Washer Flt SS #10	48.	.01	.48	
00008	901-2020	0	6	00700	901-2020	Washer Lk SS 1/4	40.	.02	.80	
00009	901-2014	0	6	00800	901-2014	Washer Lk SS #10	24.	.01	.24	
00010	901-0040	0	6	00900	901-0040	Screw ShtMtl PnHdSl SS #10x1/2	24.	.04	.96	
00011	904-3003	0	6	01000	904-3003	Box Receptacle	1.	4.19	4.19	
00012	904-3004	0	6	02000	904-3004	Receptacle Double	2.	1.19	2.38	
00013	904-3005	0	6	03000	904-3005	FacePlate Receptacle Box	1.	.99	.99	
00026	260-0070	0	5	03900	260-0070	Clamp, Mixer Mounting	2.	7.50	15.00	
00014	260-0103	0	4	04000	260-0103	Bracket, Mixer Control Mtg	1.		15.75	
00015	907-4002	0	7	05000	907-4002	Channel AL 1/8x1x1 3/4x7 5/8	1.	1.31	1.31	
00016	260-0032-2	0	4	06000	260-0032-2	Spacer, Cover	6.		23.63	
00017	907-1003	0	7	07000	907-1003	Rod AL 3/4 D x 9 3/8	6.	1.33	7.98	
00018	260-0078	0	4	08000	260-0078	Bracket, Junction Box Mounting	1.		7.88	
00019	907-3002	0	7	09000	907-3002	Angle AL 1/8 x1 3/4 x1 3/4 x 3	1.	.50	.50	
00020	260-0085	0	4	10000	260-0085	Plate, I/O Patch	4.		15.75	
00021	908-0003	0	7	10100	908-0003	Sheet PVC 1/8 x 4 x 7	4.	.31	1.24	
00022	260-0084	0	4	10200	260-0084	Seal, I/O Patch Plate	4.		15.75	
00023	908-0005	0	7	10300	908-0005	Sheet NEO 1/16 x 4 x 7	4.	.20	.80	
00031	260-0057	0	3	11100	260-0057	Assy, Fill Cover	2.		7.88	
00032	906-0001	0	6	11200	906-0001	Adhesive Wthrstrp (PMX 80639)	A/R			
00033	260-0021	0	4	11300	260-0021	Cover, Fill	2.		7.88	
00034	908-0004	0	7	11400	908-0004	Sheet PVC 1/4 x 5 x 6	2.	.65	1.30	
00035	260-0030	0	4	11500	260-0030	Gasket, Fill Cover	2.		7.88	
00036	908-0005	0	7	11600	908-0005	Sheet NEO 1/16 x 5 x 6	2.	.22	.44	
00097	260-0112	0	3	11610	260-0112	Assy, Cold Finger	1.		7.88	
00222	903-3001	0	6	11611	903-3001	Bushing,RdcrCPVC 1x1/4 MPTxFPT	1.	10.42	10.42	
00223	903-5001	0	6	11612	903-5001	Elbow, 90 CPVC 1/4 SxS	1.	1.97	1.97	
00224	902-6003	0	6	11613	902-6003	Cap, Pipe AL 1/4 FPT	1.	4.72	4.72	
00225	906-0005	0	6	11614	906-0005	Cement, CPVC 714	A/R			
00226	260-0013-1	0	4	11620	260-0013-1	Nipple, Modified	1.			
00227	260-0013-2	0	4	11621	260-0013-2	Nipple, Modified	1.			
00228	903-9001	0	6	11622	903-9001	Nipple, CPVC 1/4 x 8	1.	4.34	4.34	
00037	260-0012-6	1	1	11700	260-0012-6	Assy, Heat Exchanger	1.			
00038	901-0084	1	6	11800	901-0084	Screw SckthdCp SS 1/4-20x1 1/2	275.	.12	33.00	
00039	901-2018	1	6	11900	901-2018	Washer Flt SS 1/4	275.	.03	8.25	
00040	901-2020	1	6	12000	901-2020	Washer Lk SS 1/4	275.	.01	2.75	
00041	902-6002	1	6	12100	902-6002	Plug Pipe AL 1/4 NPT	2.	2.49	4.98	
00042	902-2001	1	6	12200	902-2001	Conn Male AL (Swglk A1210-1-12	24.	6.44	154.56	
00043	906-0001	1	6	12300	906-0001	Adhesive Wthrstrp (PMX 80639)	2.	3.24	6.48	
00044	906-1001	1	6	12400	906-1001	Sealant Gskt (LOCTITE 51531)	2.	5.15	10.30	
00045	906-1002	1	6	12500	906-1002	Sealant Pipe (PMX 80434)	2.	4.38	8.76	
00046	906-1003	1	6	12600	906-1003	Sealant ALUMASEAL	1.	1.29	1.29	
00052	260-0106-1	1	5	12610	260-0106-1	Manifold Cover	5.	33.33	166.65	
00053	260-0106-2	1	5	12620	260-0106-2	Manifold Cover	5	37.33	186.65	

Figure 2. Partial indented bill of materials

the items used in their product. A second problem was associated with the structure of the product—the final unit could be broken down into major assemblies. Each of these could be further broken down into sub-assemblies, then down even further to sub-sub-assemblies until, at the bottom of the product structure "tree," the purchased parts are shown.

"We also needed to know which parts were purchased and which were fabricated (either by TESI or other vendors)," Hitchin recalled, "...also how much each item cost, and how many places an item might be used in the finished product (a 'where used' capability). I wanted to be able to control the creation and assignment of part numbers, and give our engineers an easy way to determine if a part they needed had been previously used. This would avoid duplication of effort in engineering and give us economies of scale in purchasing. I thought Profile II could be adapted to give partial—if not total—solutions."

Figure 1 shows the fields that Hitchin defined. These fields would be present in every record. Profile II allows up to 85 characters per record segment and all of them were used.

The first field, the part number field, is 11 characters long and has the form xxx-yyyy-zz. The code xxx is a product identifier for marketing; yyyy is an item number assigned sequentially; and zz is a code used to differentiate parts requiring paint, extra machining, a different configuration, etc. For example, a plate might have the part number 900-6000-00, while the same plate with paint would be 900-6000-01, and painted and drilled with four holes it would be 900-6000-02.

The next field, group number, is used to identify the major assembly in which this part is contained. For the thermal energy storage system, these codes are:

1 = Top Assembly
2 = Heat Exchange Assembly and Top Plate
3 = Mixer Assembly
4 = Mixer Control Assembly
5 = Boxed and Bagged Salt Solution Assembly
6 = Residential Hot Pack
7 = Commercial Hot Pack

Indent number is used to control the structuring of the product. It tells how many spaces a part number is indented on an indented bill. The number of indents have a meaning as well.

0 = Final Assembly
1 = Sub-assembly

2 = Sub-sub-assembly
3 = Sub-sub-sub-assembly
4 = TESI Fabricated part
5 = Vendor fabricated part
6 = A purchased part
7 = Raw material

The control number and indented part number combine to yield a unique number by which a given part in a product can be identified and retrieved. It is the control number that actually gives the unique identification—not only to the part, but also its place in the indented bill of materials. Control numbers were therefore originally assigned in increments of 100 to allow for the insertion of parts. Figure 2, a partial indented bill of materials for the storage tank assembly, shows that for this report the major sort field is control number.

The 30-character description field contains a Mil-Spec description to assure consistency and enables retrieval by part description. For example, according to military specifications, the description of all washers starts with the word "washer." A retrieval of all records with a description greater than or equal to "washer" but less than "washers" would result in finding all the different washers used in the product. The quantity per assembly, unit cost, and extended cost are used for product pricing and purchasing.

Figure 3 shows the screen that is displayed when one wishes to add a record to the file. Figure 4 shows what this screen looks like when filled in. Note that there is some redundance in the part definition, and that care must be exercised in indenting the part number the correct number of spaces.

When the input of the bill is complete, reporting all records in control number order results in a very respectable looking indented bill of materials. Part of the storage tank assembly is shown in figure 2.

To list a sub-assembly, one needs to refer to this master bill of materials and retrieve a sequence of control numbers. Figure 5 shows the indented bill for the cold finger assembly, part number 260-0112. It was retrieved by finding all control numbers between and including 11610 and 11622, and printing the records in a pre-defined format sorted in control number sequence.

The quantity per assembly is inaccurate because the notation A/R, meaning "as required," is interpreted numerically by Profile II. However, the extended costs

```
                    PART NUMBER ENTRY FOR
                  MASTER BILL OF MATERIALS

                                        XXXXX 0123456789
CONTROL NUMBER AND INDENTED PART NUMBER:
                        REPEAT PART NUMBER:
                        REPEAT INDENT NUMBER:
                                        0= FINAL ASSY
GROUP NUMBER:                           1= SUB ASSY
                                        2= SUB SUB ASSY
UNIT COST:                              3= SUB SUB SUB ASSY
QUANT/ASSY:                             4= TESI FAB
                                        5= VENDOR FAB
EXTEND COST:                            6= PURCHASE PARTS
                                        7= RAW MATERIAL

DESCRIPTION:
```

Figure 3. Recording a part

```
                    PART NUMBER ENTRY FOR
                  MASTER BILL OF MATERIALS

                                        XXXXX 0123456789
CONTROL NUMBER AND INDENTED PART NUMBER:  11621     260-0013-2
                        REPEAT PART NUMBER:     260-0013-2
                        REPEAT INDENT NUMBER:   4
                                        0= FINAL ASSY
GROUP NUMBER:  0                        1= SUB ASSY
                                        2= SUB SUB ASSY
UNIT COST:      5.23                    3= SUB SUB SUB ASSY
QUANT/ASSY: 1.                          4= TESI FAB
                                        5= VENDOR FAB
EXTEND COST:    5.23                    6= PURCHASE PARTS
                                        7= RAW MATERIAL

DESCRIPTION:  Nipple, Modified
```

Figure 4. View of screen after all part numbers are entered.

and totals are correct and provide one of the valuable benefits of the system.

Figure 6 indicates everywhere part number 901-2012 is used in this bill of materials. It was found by searching for that part number and printing in the pre-defined report format.

To find out which assemblies these washers are used in, it is necessary to refer to the master bill of materials (figure 2), which is sorted in control number order, making it easy to locate the part. More importantly, it can now be seen how many washers of this type are required to build one unit of finished product and what the total cost of those washers is.

Using the indent part number, it would be possible to retrieve all purchased parts, all final assemblies, or all vendor fabricated parts. Using the control number in combination with the indent number, one could produce single level bills of material.

Some weaknesses of the Profile II system that do not make it equivalent to a bill of materials processor include a redundancy of information within the record. If a part is used in more than one place in an assembly,

MASTER BILL OF MATERIALS
Thu Aug 13 1981

REC NO	PART NUMBER	GRP NO	IND NO	CONTROL/ NUMBER/	INDENTED PART NO	DESCRIPTION	QTY PER	UNIT COST	EXTEND COST	NOTES
00097	260-0112	0	3	11610	260-0112	Assy, Cold Finger	1.		7.88	
00222	903-3001	0	6	11611	903-3001	Bushing,RdcrCPVC 1x1/4 MPTxFPT	1.	10.42	10.42	
00223	903-5001	0	6	11612	903-5001	Elbow, 90 CPVC 1/4 SxS	1.	1.97	1.97	
00224	902-6003	0	6	11613	902-6003	Cap, Pipe AL 1/4 FPT	1.	4.72	4.72	
00225	906-0005	0	6	11614	906-0005	Cement, CPVC 714	A/R			
00226	260-0013-1	0	4	11620	260-0013-1	Nipple, Modified	1.			
00227	260-0013-2	0	4	11621	260-0013-2	Nipple, Modified	1.			
00228	903-9001	0	6	11622	903-9001	Nipple, CPVC 1/4 x 8	1.	4.34	4.34	
							2527.00		29.33	

Figure 5. Indented bill for cold finger assembly

MASTER BILL OF MATERIALS
Thu Aug 13 1981

REC NO	PART NUMBER	GRP NO	IND NO	CONTROL/ NUMBER/	INDENTED PART NO	DESCRIPTION	QTY PER	UNIT COST	EXTEND COST	NOTES
00007	901-2012	0	6	00600	901-2012	Washer Flt SS #10	48.	.01	.48	
00084	901-2012	1	6	14400	901-2012	Washer Flt SS #10	56.	.02	1.12	
00103	901-2012	2	6	16400	901-2012	Washer Flt SS #10	5.	.01	.05	
							109.00		1.65	

Figure 6. Demonstrating where part number 901-2012 is used

all that part's information must be duplicated under a different control number. There is little editing on input, so great care must be exercised in both data entry and checking. Unanticipated changes or additions to the product might result in lack of adequate intervals between control numbers. Finally, for each retrieval, a sequential search of the entire file is necessary. This can be very time consuming for large files, but it is a constraint of Profile II.

Despite weaknesses, the system is doing the job for TESI. Hitchin claims he has less than two days development time in his method and it has solved many of his document control, product pricing, and purchasing problems for the present. □

THE NEXT GENERATION— 32-BIT MICROPROCESSORS

by Terry Benson

The term "microprocessor" was coined about a decade ago and generally was interpreted to mean that the computing power of a particular family of ICs (integrated circuits) resided in a range of one to several parts. The latest microprocessor from Intel is an astounding advancement over what the company introduced just a decade ago.

The iAPX 432 is the next step in higher processing capability and denser silicon circuits. The 432 is a family of three VLSI (very-large-scale-integration) devices, two of which make up the general data processor, with the third used as the interface processor. In development for over six years, the unit incorporates a number of features that allow it to outperform all of today's microcomputers, most minicomputers and even some mainframes. In fact, Intel calls this family a Micromainframe.

The first microprocessor, designed initially as a calculator chip, was Intel's 4004. The minimum set of chips consisted of from three to four parts that could be expanded into additional computing capability. While I know of no true microcomputer developed around the 4004, there are several thousand applications where it was used to replace logic for controlling a specific function—applications where computing or calculating were not even considerations.

The next step in microprocessor integration was the introduction of the little used Intel 8008, whose architecture was eventually incorporated into the now famous 8080. The spinoffs of the 8-bit microprocessor based on the 8080 include Intel's 8085 and Zilog's Z80. The microprocessor in these cases was a single device (40-pin dual in-line package—DIP), but when it was incorporated with from 20 to 50 additional DIPs including memory devices, it became what is now referred to as a microcomputer. The microcomputer started to have the appearance and capabilities of some of the minicomputers available at that time, which incorporated hundreds of integrated circuits. Many of the most popular small business computers are still based on these 8-bit microprocessors.

The next step in the development of the microprocessor appeared in the form of a 16-bit processor from companies like Texas Instruments (9900) and, more recently, Intel (8086), Zilog (Z-8000) and Motorola (68000). Since these devices are relatively new by computer standards, they have not yet been incorporated into many small business applications. While a few companies have incorporated the increased power of the 16-bit processors into small business applications to provide multi-user environments and higher throughput afforded with the higher speed 16-bit microprocessor (IA Nov 81), there has been little emphasis on using the 16-bit microprocessors in the single user small business computers. However, the advent of the 16-bit microprocessor has made it easier to approach the functional capability of more popular minicomputers with fewer parts and lower costs.

Onward in the binary progression of the microprocessor word size, the 32-bit microprocessor emerges. But the iAPX 432 emerged slowly.

The ambitious design goals set forth near the beginning of the project could not have been achieved without a corresponding advance in semiconductor technology. As it is, the three major components in the iAPX 432 family are some of the densest VLSI circuits manufactured. The instruction decoder (43201) contains more than 100,000 devices. Each of the three members are packaged in a 64-pin IC and dissipate up to 2.5 watts. (By comparison, the standard 8-bit microprocessors dissipate less than half of that.)

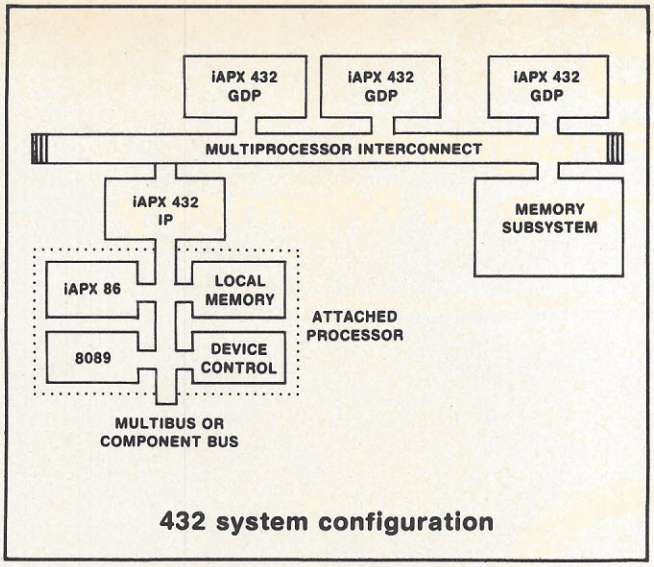
The major design goals established after this unique micromainframe concept were directed, to some extent, by requests and suggestions from potential users. The four major design objectives were: to provide mid-range mainframe computing power; to have the ability to incrementally expand processing power *without* changing existing software; to support the development of modular software in order to improve programming efficiency, and to reduce the cost of software; and to provide hardware and software dependability in order to handle critical applications.

All of these design objectives—and more—have been met. In order to accomplish these goals, the hardware and software were considered together to take advantage of the improved performance that could be attained by using Ada, a Pascal-like language, utilized by the U.S. Dept. of Defense as the native high-level language. The system dependability and reliability are provided both by built-in hardware fault detection and through software security mechanisms.

The three members of the iAPX 432 family are the instruction decoder/microinstruction sequencer (43201), the execution unit (43202) and the interface processor (43203). The 43201 and the 43202 make up the general data processor (GDP) in the iAPX 432 micromainframe. The interface processor (IP) provides for fully isolated —independent and protected—I/O subsystems.

Hardware fault detection is provided in the individual components. The GDP can be defined either as a master, operating normally, or as a slave or self-checker. In the checker mode, those pins that normally operate as outputs function only in the input mode and are connected to the corresponding pins on the master GDP. Both GDPs operate in parallel, but the checker is comparing its internal signals with those from the master. If any mismatch occurs, an error is flagged.

The 432 is a "number cruncher" in the true sense of the word. The GDP is not interrupt driven, as are most



432 system configuration

of the 8- and 16-bit microprocessors; however, the interface processor (IP) does incorporate an interrupt structure for communicating with the outside world. The architecture is designed so that the IP communicates with a peripheral subsystem consisting of one or more 8- or 16-bit microcomputer systems each with its own I/O. (See figure.)

Additional IPs can be added to the system and more GDPs can be added to an existing system, thereby increasing the computing power. In fact, the number of GDPs can be increased or decreased without the need to adapt *any* software (operating system or application program) to the revised system. This provides for true transparent multiprocessing.

In lieu of interrupts to the central GDP, the IPs use messages to communicate to the GDP by emulating some of the messages that another GDP might be sending. This communication path is provided on an isolated multiprocessor interconnect bus, which is shared only by GDPs, IPs and main memory. No direct access to memory can be made by any external I/O processor.

This isolation, in addition to the object-oriented architecture, provides some of the more unique features found in the system. In addition to enhanced interprocessor communication and resource management, a complete memory and I/O protection system can be implemented. This approach requires that a program must contain a certain object access descriptor in order to access any object in the system—be it hardware or software. The use of the access descriptor (up to 2^{24}) along with a maximum object size of up to 2^{16} bytes provides an astounding virtual memory capacity of up to 2^{40} (1 trillion) bytes of information.

When the 432 is configured into a system, multiprocessing, multifunction and multiuser applications can be handled more easily than with most other computer systems available today or even projected for the near future. Office information equipment, distributed data processing systems, automation systems and others are primary candidates for this improved system performance.

While Ada is the system programming language of the 432, other applications languages such as Fortran, Cobol and Pascal can easily be supported. In fact, features within both the hardware and Ada will simplify compiler generation for virtually any high-level language.

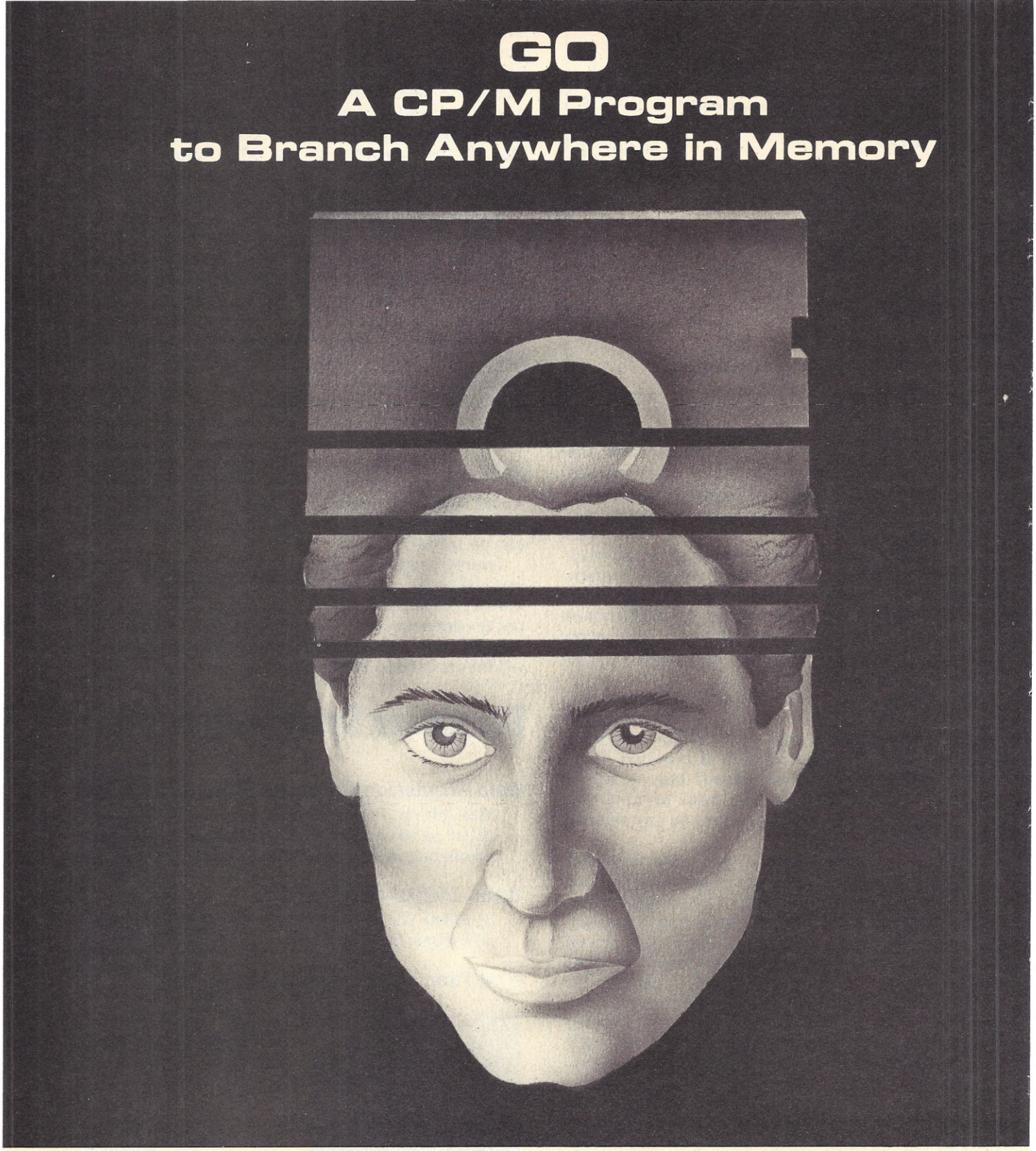
One method of comparing system performance is evaluating the MIPS (million instructions per second) that a CPU can perform. Through simulation, the iAPX 432 has been established at from .25 MIPS (single GDP) to 2 MIPS with several GDPs in parallel. A VAX 11/780 is rated at about 1 MIPS and the IBM 370-158 is rated at about 2 MIPS. This should provide a relative idea of the capability of the 432. Naturally, these numbers depend on system configuration, memory speed and other implementation parameters.

In addition to the iAPX 432 chip set, Intel has also designed a system utilizing the architecture of the iAPX 432 micromainframe. The System 432/600 consists of circuit boards, backplanes, card cages and chassis, which provide an extensible computer system. Up to six processors, either GDPs or IPs, can be configured in the system operating at up to about .8 MIPS. With up to 4 Mbytes of memory with ECC protection, this can provide for a very powerful desktop 32-bit computer system.

It is almost certain that by the end of the decade, the iAPX 432 will be operating in a variety of systems that would not have been considered prior to this time. Either the cost or sheer bulk of other approaches would have long ago discouraged some of the applications to which this next generation microprocessor can be utilized.

Twenty years ago, the mainframe computing power was just being condensed into the minicomputer. During the last 10 years, the computing power of the mini was being condensed into the microcomputer. During the next decade, the computing power of the mainframe will be condensed into a micro. □

GO
A CP/M Program to Branch Anywhere in Memory



by Alan R. Miller

Executable programs that run under CP/M are usually designed to be run starting at address 100 hex, since this is where programs are loaded by CP/M. There are times, however, when it is desirable to assemble a program for operation at some other location. System monitors and debuggers are two examples of this type. These programs are usually located in ROM, placed above the CP/M operating system, or high in the regular memory. In either case, there is no easy way to get to these locations from the CP/M operating system.

The assembly language program shown in the accompanying listing can be used to branch to any location in memory. If the resulting binary file is located on disk drive A, the CP/M command:

A>GO F000

will cause a branch to the address F000 hex.

The GO program demonstrates several of the I/O features available with CP/M. The branch address given as an argument on the above command line is read from a region of memory called the file-control block (FCB). The address of the FCB is 5C hex, but the ASCII-encoded address starts at 5D hex. If the input address (F000 in this example) is a valid hexadecimal number, it is converted from ASCII into a 16-bit binary number. The result is placed into the CPU program counter so that the computer will branch to the desired address. The address format is free form, and leading zeros are unnecessary. If more than four characters are entered, only the last four are used. Thus all of the following are valid.

0
900
6000
F000 and
PF800

If no argument is given to the GO command, or if an invalid hexadecimal address is entered, an error message is printed. This step uses the console string-output feature. It is selected by placing the CP/M function code of 9 in register C. The DE register pair is loaded with a pointer to the string location in memory. A dollar sign ($) is used to indicate the end of the string.

Retyping data

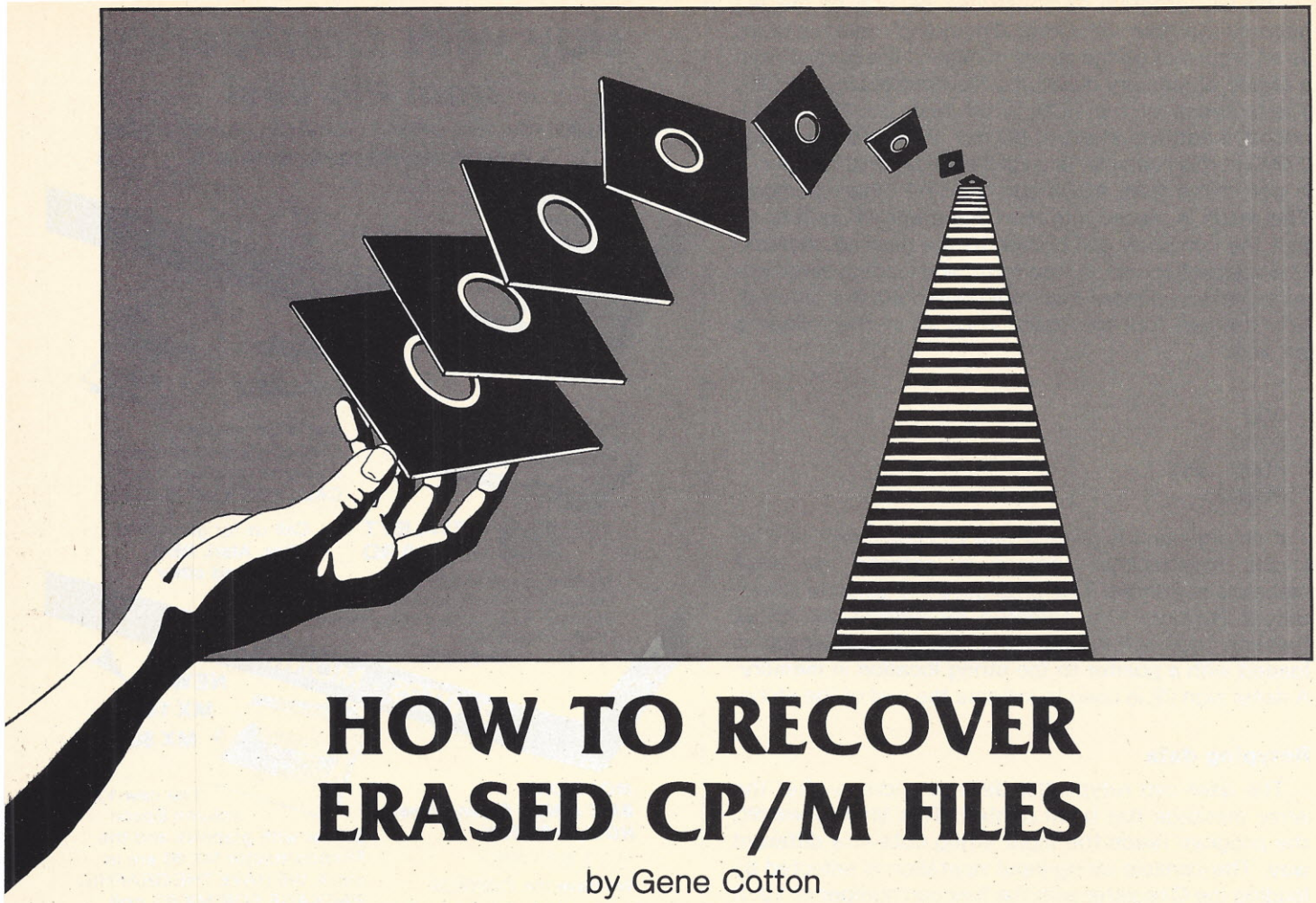
The user can retype the desired address after the error message has been printed. This time, however, the program reads the input string data in a different way. The console string-input operation is selected by loading the C register with the function number of 10. If the new string is a valid hex number, it is converted to a 16-bit binary number. The computer then jumps to this address. If the input is still invalid, the error routine is repeated again.

During the input operation, the usual CP/M commands are available for error correction. For example, the most recently typed character can be deleted by pressing the DEL key. A control-R will reprint the current line in its corrected form. A control-U cancels the entire line so that it can be retyped. If version 2 of CP/M is being used, the backspace character, control-H, can also be used for correcting errors. In this case, the cursor backs up on the screen, removing the undesired character. Finally, a control-C can be entered to abort the entire program. This returns control to the CP/M operating system.

Type up the GO program given in the listing. Assemble it and try it out. GO is a universal program; it will work on any CP/M system. If you have a monitor located in memory, use GO to branch to it; if not, you can still try out the GO program. Type just the command GO without an argument. An error message should be printed Type some characters, then delete some of them with the backspace or DEL key. Finally return to CP/M by giving the address of zero. A control-C can also be used to return to CP/M. □

Adapted, by permission, from Dr. Miller's book The 8080/Z80 Assembly Language: Techniques for Improved Programming *©1981 by John Wiley & Sons, New York.*

Program on page 144



HOW TO RECOVER ERASED CP/M FILES

by Gene Cotton

The safest and most reliable method of guarding a disk file against accidental erasure is to make a copy of it on another disk. To guarantee every file would mean doubling the number of disks, which is a considerable expense. But even when a good disk back-up policy is used, duplicating the files that are currently being used is often forgotten in the fever of the creative process.

There are times when the last copy of a program or text file is erased, and you wish there was some way to undo the ERA command. A favorite method of mine happens at the end of a long session of Basic program writing. I decide to clean up the disk by erasing the unnecessary .BAK files and issue the CP/M command sequence:

```
A>ERA *.BAS
A>DIR
```

Looking at the directory, I realize the .BAK files are still there, but all the new .BAS files are missing. This is a hard lesson in carelessness.

To combat this frustration, a program is presented that will unerase certain files. The program will be written using 8080 assembly code, which is compatible with any 8080, 8085, Z80 CP/M system. The program should run on any CP/M version 2.2 system without modification.

Before the program is presented, let's discuss CP/M's directory and data allocation techniques.

A disk consists of a number of concentric circular recording paths or tracks. The 8-in. disk has 77 such tracks. Each track logically resembles a strip of recording tape twisted into a loop. The tracks are numbered with the outside track as 0 and the innermost track as 76. Each track can hold a reasonably large number of characters or bytes, with the logical beginning of the strip determined by a hole in the disk called the index hole. This hole can be seen just to the upper right of the large spindle hole in the center of a disk.

With 6-7,000 characters per track possible, it is not practical to use the entire track as a physical record in microcomputers. The track is divided into smaller arcs or sectors. The sectors can be associated with a number of evenly spaced physical holes close to and ringing the spindle hole. Each sector is written following the detection of this hole, and the disk is said to be hard-sectored. Even without the holes, it is possible to partition the track into logical sectors by writing a number of separator characters (sometimes called the preamble), followed by a sector of identification number, followed by the logical sector of data, followed by another group of separator characters (sometimes called the postamble). The normal 8-in. disk is divided into 26 such logical sectors per track and is referred to as a soft-sectored disk. The sectors are usually numbered from 1 to 26 in the direction of travel around the disk.

The size of the physical sector depends upon the number of characters per track or density. Single density, soft-sectored IBM compatible disks have 128-byte sectors, 26 sectors per track and 77 tracks per disk. Double density disks are generally 256-byte sectors or 52 sectors per track. Some disk systems

are not easily molded into this simple definition. There are 5-in. disks with 30 sectors of 256 bytes each. Some disks have 512 or 1,024-byte sectors with various numbers of sectors per track, and differ in the number of tracks per disk. The discussion so far is generally true for floppy disk storge. We will continue to consider only the "standard" 8-in. disk.

CP/M divides each floppy disk into two distinct sets of tracks. Tracks 0 and 1 are the system tracks. The CP/M program is held here and read in from the disk during the booting process. The only time these tracks are written onto is during the system copy process using the SYSGEN command.

Tracks 2 through 76 are considered the data tracks of the disk. Grouping the sectors together eight at a time would produce 243 blocks of eight sectors per block. These are the allocation blocks. The first block is numbered 0, and the adjacent blocks are sequentially numbered through the last block at 242. In order to keep track of file names and storage used by each file, the first two allocation blocks are set aside for the directory.

The storage allocation technique used by CP/M considers each file as a stream of allocation blocks. When new storage is needed for a file, a block is allocated from the unused blocks beginning at block 2 and progressing through block 242. The block is stored in the directory entry for that file. Each directory entry has room for 16 block numbers, which represents 16 allocation blocks of eight sectors each or 16,384 characters. Since 16,384 = 16 × 1,024, this is sometimes referred to as 16 kilobytes or 16K.

When a particular file requires more storage than 16K, additional directory entries are created. Each one contains an identifier or extent number. Each extent controls a 16K portion of the file. The number of sectors in this extent is also stored in the directory entry. Each directory entry, except the last one, will control 16K or 128 sectors.

Each directory entry is 32 bytes long. Four directory entries can be stored on one 128-byte sector. The allocation blocks used for the directory provide for 16 sectors. This means that the normal CP/M disk can contain no more than 64 files. If any file is over 16K, the total number of files possible is reduced by the number of additional directory entries needed by the file.

Each 32-byte directory entry is organized as follows:

Byte	Description
1	This byte will be a hexidecimal (hex) E5 if this entry is not being used. Any value between 00 hex and 0F hex indicates that this entry is active for the user level 0 to 15 specified by this byte.
2-9	Eight character file name. Left justified and filled with spaces to the right of the field. High order binary digits or bits are set to zero. Note that ASCII characters typically use only the rightmost 7 bits.
10-12	Three character file type. Left justified and filled with spaces to the right of the field. High order bits are used for read-only and system-file flags.
13	The extent number of this directory entry. In the range 0 to 31.
14-15	Not important.
16	The number of sectors in this extent. In the range 0 to 128.
17-32	Sixteen bytes used to hold the allocated block numbers used in this extent. Filled in from byte 17 first to byte 32 last. Note that largest block is 242 and a single byte of 8 bits has a maximum value of 255. Unused bytes have a value of zero. The number of sectors indicates how many bytes are used.

The first byte of the directory entry indicates whether the entry is in use. CP/M expects the disk formatting program to initialize every sector on the disk to hex E5's. In order to activate a new directory entry, CP/M looks for the first entry with an E5 hex in position 1 of the entry. The entry is filled out with the file information, and the first byte is set to the value of the current user level. The first byte of most active directory entries is 00 hex, since most people use the default user level number of zero.

When the CP/M command ERA is used, the file to be erased is not physically erased from the disk. It is only necessary to remove the directory entry to logically remove the file from the disk. With the directory entry erased, CP/M no longer has the means to determine which allocation blocks belong to the file and the file no longer exists. The data file is physically still on the disk until the released allocation blocks are reallocated to some other file. This means that a file might still have a chance of being recovered as long as no other files have been added or extended.

The directory entry is not physically erased during a CP/M ERA command. The directory entry is logically deleted by setting the first byte to the value E5 hex. CP/M detects the entry as unused, and it is ignored until a new directory entry is required. Unused entries are allocated from the beginning of the directory blocks. Thus the erased directory entry is still physically available until the entry is reused for some other file requirement.

It seems reasonable to assume that a file can be recovered if its directory entries are reactivated before any other file writing activity goes on. This assumes that there is no ambiguity about which files were just erased. There is a situation when the file that was erased is not so easily identified.

Creating files

When the CP/M command PIP is used, a file is created with the destination file name and a $$$ file type. The origin file is then copied into this file. After the file transfer is complete, any files with the destination file name and type are erased. The temporary file name with file type $$$ is then renamed to the correct destination file name and file type.

If this PIPed file is erased before the directory entries for the old version of the file are reused, the directory will contain unused entries with that file name and file type, but it will not be clear which is the correct one to re-activate. To make matters worse, suppose that each of the two erased files was larger than 16K and required multiple directory entries. Which second extent should go with which first extent?

The problem of recovering an erased file is now unbearably complicated. There does not appear to be a foolproof method of recovering an erased file.

If the above problems are ignored and all the directory entries found are re-activated, the worst that can happen is that the results will be totally useless. If that occurs, the files should be erased again. At best, the lost file is recovered. The result is that you are no worse off—and possibly much better off—than before. It should be reiterated that this solution is no replacement for a sound back-up procedure.

What is desired is a program that will scan the CP/M directory, looking for a match with a supplied file name and file type. If a match is found and the directory entry has an E5 hex as the first byte, change that first byte to a 00 hex.

Since the directory is not a part of any file, the primitive disk routines will be used. The physical and logical disk routines are dependent upon the specific disk equipment and disk controller boards used, but each CP/M system has a common set of routines that are called by the CP/M basic disk operating system (BDOS). These primitive routines are contained in the basic input/output system (BIOS) and are prefixed with a jump table. A jump table is a list of machine level branches or jumps to the actual location in memory that contains the routine. Each routine returns to the calling routine by using the return address stored on the system stack at the time of the call to the routine.

Assembling a program

The physical sectors of each track do not correspond to the logical sectors accessed by CP/M. Logical sectors are numbered from 0 to 25 with two adjacent logical sectors being six physical sectors apart. This will require the use of a sector translation routine. CP/M version 2.2 has an additional BIOS jump vector for such a routine, while the older version 1.4 does not. The program is written using recursive refinement techniques, and the comments should allow anyone to decipher twists and turns within my logic.

Enter the program using any standard editor like CP/M's ED program. For the following examples, suppose that the source file is named UNERA.ASM.

Assemble the program using any standard 8080 assembler like CP/M's ASM program. The command line

```
A>ASM UNERA
```

will produce a print file UNERA.PRN and the machine code file UNERA.HEX, which must be transformed into transient command form using CP/M's LOAD program. The command line,

```
A>LOAD UNERA
```

will produce the UNERA.COM transient command file.

The program is now in a usable form. To execute the program and attempt recovery of an erased file "JUNK.JNK", enter the command:

```
A>UNERA JUNK.JNK
```

Any inactive directory entry with a file name and type as JUNK.JNK will be reactivated.

At this point, the file is very suspect and should be checked and possibly PIPed into some other file. Never use this program if a reasonably current back-up copy of the file exists. Always assume that the file has problems after recovery. □

Continued on page 146

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CALENDAR PROGRAM

by Jerry Delgado
Applied Business Software
15614 S. Hawthorne Blvd., Suite 104
Lawndale, CA 90260

All large multifaceted programs are comprised of many sub-programs, each of which performs one of the functions necessary to produce the desired end result. In the process of software development, a library of such sub-programs or mini-programs is accumulated, facilitating the completion of subsequent projects by providing a larger program library from which to draw.

The following program listing illustrates one such mini-program that was developed as part of an elaborate scheduling program. The program will produce a calendar for any month of any year, taking into account leap years. It was written for use with the Microsoft Basic Compiler and the screen commands correspond to those used on the I.B.M. 3101 terminal.

Nested loops are used throughout the program, thus providing a clearer program structure. Note also the use of remarks and comments. This is invaluable in a software house situation where a program needs to be easily understood by other programmers who may not have been involved in the initial development, but who may be called upon to make changes to existing code. The time spent at the onset to incorporate these remarks into the code will be recovered tenfold.

When using other CRTs, a change must be made to line 280, which sets the CLEAR SCREEN codes for the particular terminal being used. Also, line 790 establishes the length of the calendar squares. In order to view the entire month's calendar on the screen, the square size is set to a value of 2. If, on the other hand, the calendar is to be printed, you may wish to change the value to a number greater than 2. For example, if the squares are to be five lines long, line 790 would be changed to read: FOR Z1% = 1 TO 5. This will produce larger printed squares. □

Program on page 150

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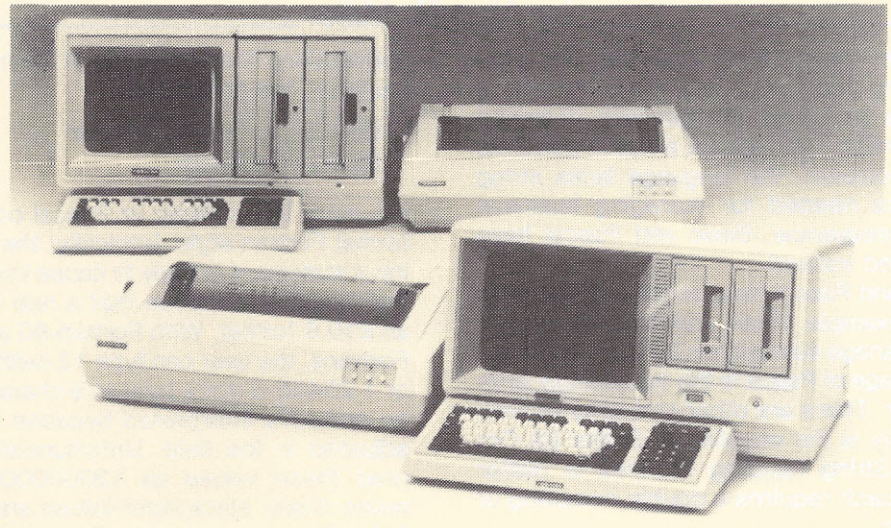

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Supersoft's SSS Fortran for CP/M

by Alan R. Miller

Fortran compilers have been available on large computers for many years; consequently, there is a wealth of available software. Fortran was designed specifically for scientific calculations, a task it performs reasonably well. However, the language lacks string handling capabilities needed for managing business records. As a consequence, Basic and Pascal have frequently been used instead.

However, Basic and Pascal have serious deficiencies of their own. For example, Basic variables are global, so it is difficult to manage subroutines in large programs. The major disadvantage of Pascal is the exceedingly large size of the compiler. There are other problems as well.

Another possibility is the coupling of Ratfor (IA Oct 81) with Fortran. String handling routines in Ratfor exist, but this approach requires a double compiling of the source program.

Fortran for CP/M has been available from Microsoft for several years (IA Mar 79). This superb version, called Fortran-80, allows an integration of routines with those written in assembly language as well as those written in Cobol, and the compiling Basic.

Now a second CP/M Fortran, called SSS-Fortran, is available from Supersoft Associates, Champaign, IL. While both Fortran-80 and SSS-Fortran follow ANSI 1966 standards, they differ markedly in many ways. Firstly, SSS-Fortran only runs on a Z80 while Fortran-80 also will run on an 8080 and an 8085 CPU. Both Fortrans utilize 32-bit binary floating-point arithmetic. However, SSS-Fortran has a dynamic range of 10 – 78 to 10 + 78, whereas Fortran-80 is limited to 10 – 39 to 10 + 39. The difference, however, shows up in the mantissa where Fortran-80 has greater precision. Of course, both incorporate 64-bit double precision operations for greater mantissa accuracy.

SSS-Fortran incorporates several data types in addition to real and double precision. These include logical, complex, double precision complex, one-byte and two-byte integers, and character variables. This last item makes SSS-Fortran very special. Scalars and array elements can be declared as character variables of any length. For example, the declaration statement:

```
CHARACTER*80 CUST(120)
```

establishes an array of 120 elements. Each element of the array can contain a maximum of 80 characters, although they may contain less. SSS-Fortran can manipulate strings of characters dynamically, just like Basic and many Pascals.

Standard Fortran follows rigid rules for the formatting of input and output. While SSS-Fortran follows this convention, there is also a format-free mode. For example, the statements:

```
WRITE (1) ''New filename'
READ (1) FNAME
```

are more like a Basic or Pascal construction than the formal Fortran style. Ironically, the standard formatted input statement is likely to cause trouble in SSS-Fortran. For example, suppose that a real number is read with an E10.0 format. With Fortran-80 and other interactive Fortrans, the user can type 12 (without a decimal point) or 1.2345E-5 (for a total of 9 characters), and both will be correctly interpreted because the values are right adjusted in the field. Unfortunately, SSS-Fortran will read these values as 1200000000 and 1.234E-50 respectively, since input values are left adjusted in the field. Then the fields are filled with zeros.

A library of useful functions and subroutines is provided. This makes it easy to operate on string variables. One function can be used to determine the current length of a string variable and another function can be used to concatenate string variables and to find characters or substrings within strings. There are also bit and byte oriented routines. These can be used to inspect absolute memory locations or to change them, to read peripheral ports or send a byte to a port.

A collection of file-handling routines greatly simplifies disk operations. There are routines to create, open, write, close and delete disk files. Unfortunately, SSS-Fortran writes ASCII disk files in Unix style rather than in CP/M format; records are separated by only a line feed, rather than the carriage-return/line-feed pair expected by CP/M. This can be fixed, however, by two additional steps. A library routine is called to append a carriage return to the end of each record. But then it is necessary to strip an extraneous character added along with the carriage return.

The program given in the accompanying listing can be used to sort a sequence of possibly unblocked ASCII records stored in a disk file. Subroutine DWITE is used to add the necessary carriage return to each record. If you want to try the program, create a disk file called SORT.FOR using the system editor (not supplied). Compile the program with the SSS-Fortran command:

```
FOR SORT
```

This will create a relocatable disk file called SORT.REL. The source program and a variables map will appear at the CP/M list device. Alternately, the command:

```
FOR SORT; L; M
```

Program listing

```
C     PROGRAM SSORT
C
C -- Perform a Shell sort on an Ascii disk file
C
      CHARACTER*81 REC(120)
      CHARACTER*15 INFILE, OUTFIL
      INTEGER I, N, INOUT, LUNIN, LUNOUT
C
      INOUT = 1
      LUNIN = 5
      LUNOUT = 6
      WRITE(INOUT) " Name of file to be sorted: "
      READ(INOUT) INFILE
      IF (IOREAD(LUNIN, 2, 0, INFILE)) GOTO 500
10    WRITE(INOUT) " New filename: "
      READ(INOUT) OUTFIL
      IF (INFILE .NE. OUTFIL) GOTO 20
      WRITE(INOUT) " New name = old name: "
      GOTO 10
20    IF (IOWRIT(LUNOUT, 2, 0, OUTFIL)) GOTO 510
      READ(LUNIN, ENDFILE = 30) (REC(I), I = 1, 120)
      WRITE(INOUT) " ?ERROR: TOO MANY RECORDS"
      GOTO 99
30    N = I - 1
      CALL SORT(REC, N)
      DO 40 I = 1, N
       CALL DWRITE(REC(I), LUNOUT)
40    CONTINUE
      IF (IOCLOS(LUNOUT)) GOTO 520
      WRITE(INOUT) " New file successfully completed"
      GOTO 99
500   WRITE(INOUT) " ?ERROR: NO SUCH FILE"
      GOTO 99
510   WRITE(INOUT) " ?ERROR: CANNOT CREATE"
      GOTO 99
520   WRITE(INOUT) " ?ERROR: CANNOT CLOSE FILE"
99    STOP
101   FORMAT(A80)
      END
```

can be given to skip the source and map listing. The next step is to form the executable file with the linking loader. Give the command:

LOADER SORT

This will create the file SORT.COM. While it is not necessary for this program, a /L,MLIB must be appended to the LOADER command line if any of the standard Fortran functions are needed. Finally, the program is executed with the command:

SORT

When the program is executed, it asks for the name of the source file. Respond with the primary name, a decimal point, and the extension. Since a free-format read statement is used, the program will properly fill out the filename with blanks. The program then asks for the name to be used for the sorted file. Answer this question with another filename. Notice the relative simplicity of this program. Such an approach is not possible in standard Fortran, since string operations are not available. The program can be used to sort blocked or unblocked records. For example, an array of customer names and addresses, each having a different length, can easily be sorted.

Several simple tests were performed to compare the speed of SSS-Fortran to Fortran-80. For example, the time needed to complete the 3 nested loops:

```
      DO 30 K = 1, N
      DO 20 L = 1, N
       J = 1
      DO 10 M = 1, N
       J = J + 1
 10  CONTINUE
```

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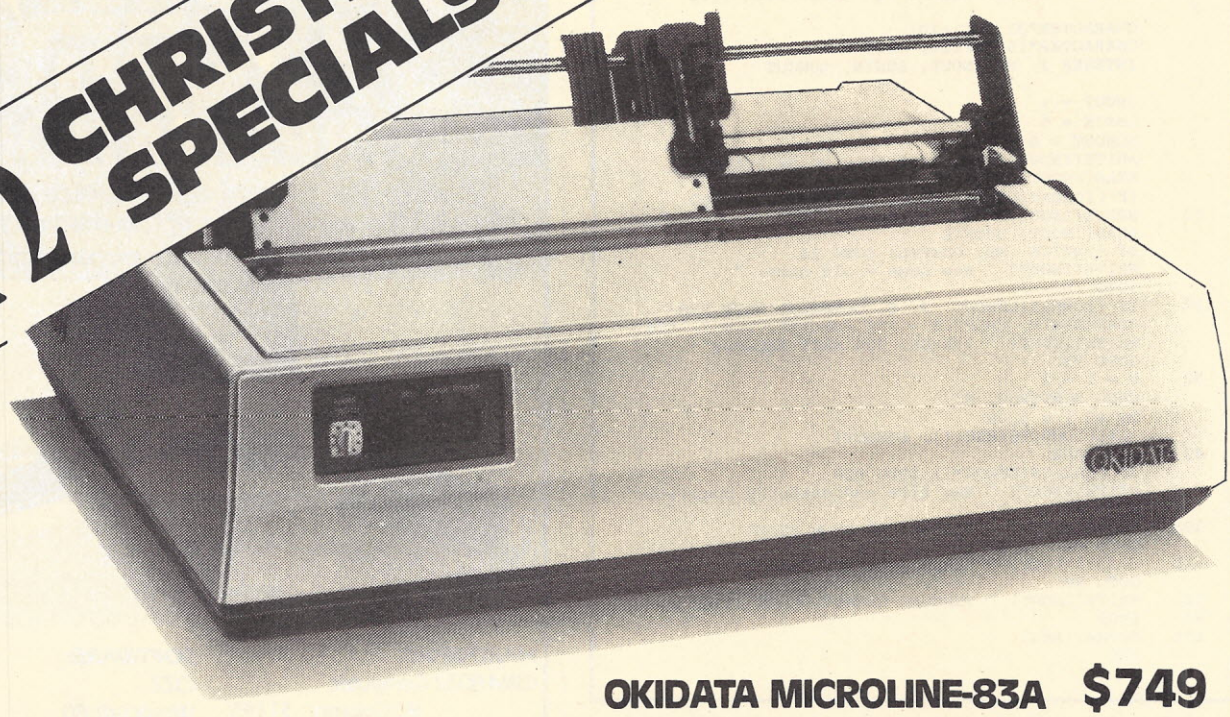

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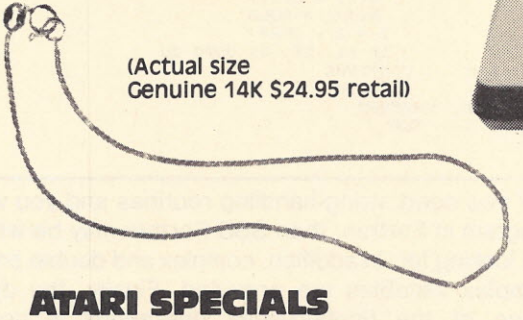

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```
20 CONTINUE
30 CONTINUE
```

for N equal to 60 was determined. Then the time for the empty loop:

```
    DO 60 K = 1, N
    DO 50 L = 1, N
     J = 1
    DO 40 M = 1, N
40 CONTINUE
50 CONTINUE
60 CONTINUE
```

subtracted. The results showed that Fortran-80 ran ten times faster than SSS-Fortran (both for loop times and the increment times).

SSS-Fortran incorporates a non-standard INCREMENT J command. When this was incorporated into the program, the speed increased. But Fortran-80 was still faster. It is interesting to note that Fortran-80 automatically optimizes the code making an INCREMENT statement unnecessary. For example, the Fortran statement J = J + 1 will generate an INX H instruction, whereas a J = J + 4 will give rise to the slower DAD H operations. (The addition of 2 or 3 will also generate the INX instruction.)

Subscript expressions in SSS-Fortran can be much more complex than in Fortran-80. The latter is limited to a single variable. However, SSS-Fortran allows expressions such as X(I + J). Apparently, no random number generator is provided (Fortran-80 does have one). The ENCODE and DECODE commands are not supported, although direct memory-to-memory conversion through input and output statements is available. Parameters can be passed to subroutines, either by location or by value. The address of the parameter is the default, but the corresponding value can be substituted by enclosing the argument in parentheses. The built-in sine function contains a common error. The argument is squared before a range check is made. Consequently, the sine of 10 – 40 is incorrectly given as 10 – 78. One very nice feature of SSS-Fortran is that expressions can be used in loops and write statements. Thus the statements:

```
DO 20 I = J + 1, N - 1    and
WRITE (1, 101) X, 1/X, SQRT(X)
```

are acceptable.

Subroutine

```
      SUBROUTINE DWRITE(REC, LUNOUT)
C
C -- Add carriage return to string record REC
C -- and write it to the disk file LUNOUT
C
      CHARACTER*81 REC
      CHARACTER*15 OUTFIL
      CHARACTER*1 CR
      INTEGER LUNOUT
      DATA CR/13/
C
      CALL ADDSTG(REC, CR)
      LEN = KLEN(REC) - 1
      CALL SETLEN(REC, LEN)
      WRITE(LUNOUT) REC
      RETURN
      END
      SUBROUTINE SORT(A, N)
C
C -- Shell-Metzner sort for array A
C -- from FORTRAN Programs for Scientists
C -- and Engineers, A. Miller, 1982, Sybex
C
      INTEGER N, I, J, JUMP, J2, J3
      CHARACTER*80 A(1), HOLD
C
      JUMP = N
10    JUMP = JUMP / 2
       IF (JUMP .EQ. 0) GOTO 99
        J2 = N - JUMP
       DO 30 J = 1, J2
15      I = J
20      J3 = I + JUMP
         IF (A(I) .LE. A(J3)) GOTO 30
          HOLD = A(I)
          A(I) = A(J3)
          A(J3) = HOLD
         I = I - JUMP
         IF (I .GT. 0) GOTO 20
30     CONTINUE
       GOTO 10
99     RETURN
       END
```

If you need string-handling routines and you want to program in Fortran, then SSS-Fortran may be what you are looking for. In addition, complex and double precision complex variables are provided. Finally, the dynamic range of the floating-point operations is unusually large, going from 10 – 78 to 10 + 78. Execution speed, however is slower than for Fortran-80. □

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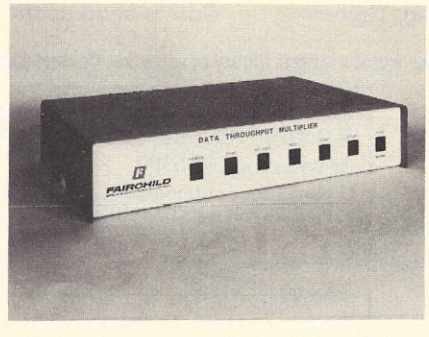

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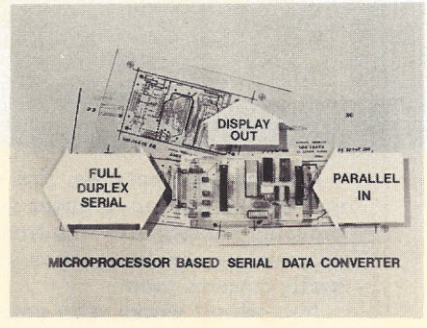

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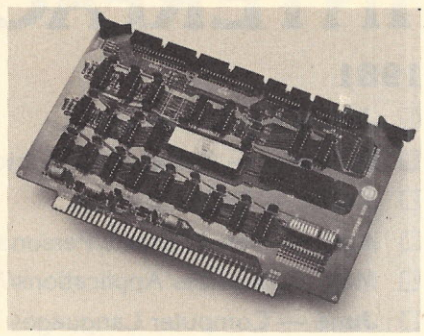

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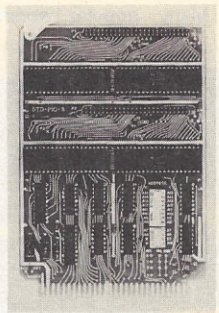

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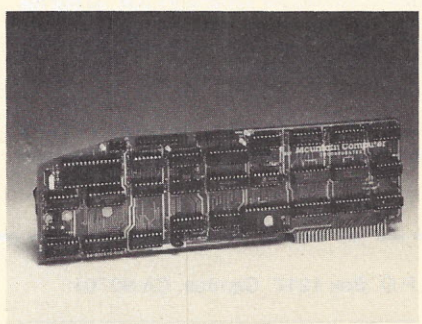
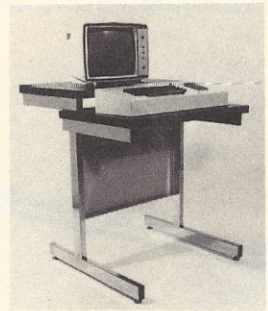


Once you have configured your card, you need never set it up again. You may also change parameters from the keyboard with control commands. All function set-ups stored on-board are battery powered for up to two years. "Phantom slot" capability permits assigning each of the functions of CPS to different slots in your Apple without the card actually being in those slots. Mountain Computer, 300 El Pueblo Rd., Scotts Valley, CA 95066.
CIRCLE INQUIRY NO. 228

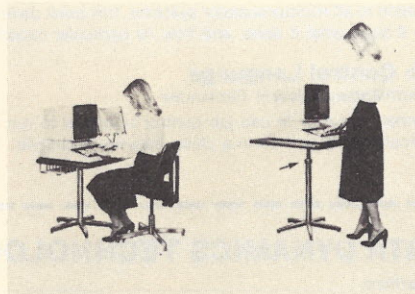
Bar code reader, the BCR1, was developed to bring bar-code programs printed in magazines into your computer. Because of its unique construction, it is especially suited for flat media. Reading is possible with a resolution of about 0.2 mm (black bar). The TTL-output signal represents black/white level on the paper. 5 V power supply is required. Contactless optical sensoring guarantees long life time. Price: $85, including airmail. Ing.Buro W. Kanis GmbH, Lindenberg 113, D-8134 Pocking, West Germany.
CIRCLE INQUIRY NO. 229

CRT work station is designed for computer terminals that have a detached keyboard. Ergonomics dictate that these computers or word processors have a split platform so the operator can type at 26 in. height, but still have correct eye level with the display screen. Dimensions are 30 in. deep (30 in.



on bottom and 17 in. on top) 24 in. or 30 in. wide, and 26 in. high on the bottom surface and 29 in. on the top surface. Chrome legs and texture painted modesty panels are standard along with a walnut laminate top. Atlantic Datafurniture Products, 4507 W. Alva Ave., Tampa, FL 33614, (800) 237-4783.
CIRCLE INQUIRY NO. 230

Terminal stand can be changed without removing hardware and disrupting the operator. The stand features a 24 in. by 30 in. top to accommodate most computer terminals and peripherals. To improve operator efficiency and provide standing and sitting convenience, height can be changed without removing the equipment. With

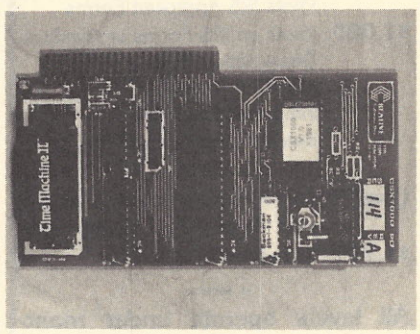


positive locking at any height from 26 in. to 36 in., the stand has a rugged five-legged base for optimum stability. The top is washable, wood grained laminate with vinyl edging. Options include a wire basket and work holder. Price: $202. Data-Mate, Maine Manufacturing Co., P.O. Box 408, 46 Bridge St., Nashua, NH 03061, (603) 882-5142.
CIRCLE INQUIRY NO. 231

Money management system, Smart, is a comprehensive, integrated system designed for institutional money managers and sophisticated investors for use on the Apple computer. The system provides capabilities

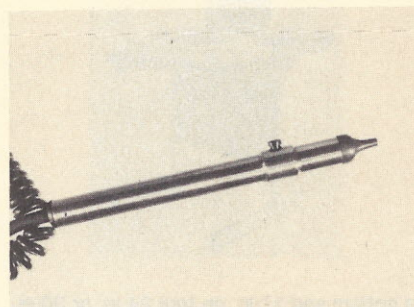
for retrieving, storing, graphing and analyzing securities and economic data. A portfolio module provides capabilities for maintaining and reporting data and transactions for securities portfolios. With this system, users can automatically access data from one or more remote data bases and prepare graphic displays in a variety of formats. Graphing options include open-high-low-close charts, volume histograms, line charts and point plots. Graphs can be full screen or independent split windows. Analytic tools include moving averages, exponential smoothing, momentum, trend lines, and user defined formulas. Requirements include an Apple II + 48K computer, two disk drives, micromodem, monitor and printer. Software Resources, 186 Alewife Brook Parkway, Suite 310, Cambridge, MA 02138, (617) 497-5900.
CIRCLE INQUIRY NO. 232

Clock and calendar device, Time Machine II, is an intelligent real-time peripheral for the



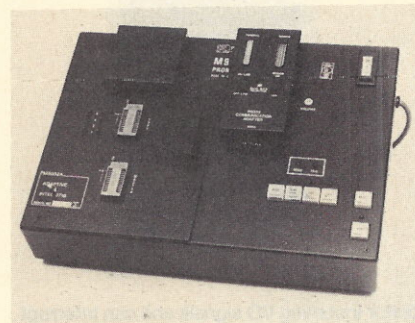
Apple II. The basic system includes: clock and calendar peripheral card; professionally prepared and printed reference manual; and applications #1 demonstration diskette. The unit is a crystal controlled, one second to 99 year clock. By using a "dynamic bank switching" technique, a powerful 2048-byte firmware driver is included that executes in the same space as 256-byte clock drivers. This firmware resides in an on-board ROM, adding many new features and making the unit easy to use. Since bank switching occurs dynamically, all options are software selectable. Creative Software Development, 4657 Thayn Dr., W. Valley City, UT 84120.
CIRCLE INQUIRY NO. 233

Interactive light pens for CRT terminals employ a single voltage supply of +5 volts @ 25 ma nominal. Spectral response is increased by 1000 Å from 4200 to 11000 Å. Phototransistors and photodiodes



have replaced the photofets previously used. Several styles of nosepiece are offered for working with different sized targets and varying intensities of CRT lighting. All processing circuitry is enclosed within the pen housing and no external adjustments are necessary. Output signals are TTL level. Prices for single pens are $175 for the FP 131 P; $197 for the FP 134 P; and $194 for the FP 135P. Fuller Engineering and Manufacturing, P.O. Box 26710 Parkmoor Station, San Jose, CA 95159, (408) 946-1188.
CIRCLE INQUIRY NO. 234

Communications interface option for the M910A PROM programmer allows the programmer to be used with development systems and enhances the M910A's usefulness in field applications. The option provides an RS232C connection between the M910A programmer and development systems, computers, terminals, peripherals or modems. Many popular communications



formats are supported by the M910A software. Main features include key-selectable communications formats, remote control of duplicate operations, and switch-selectable baud rate from 50 to 9600 baud. The M910A with communications option, having a

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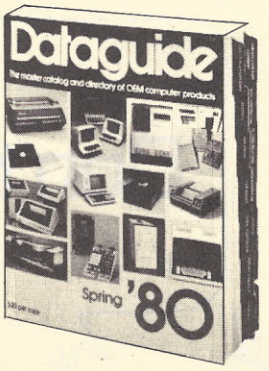

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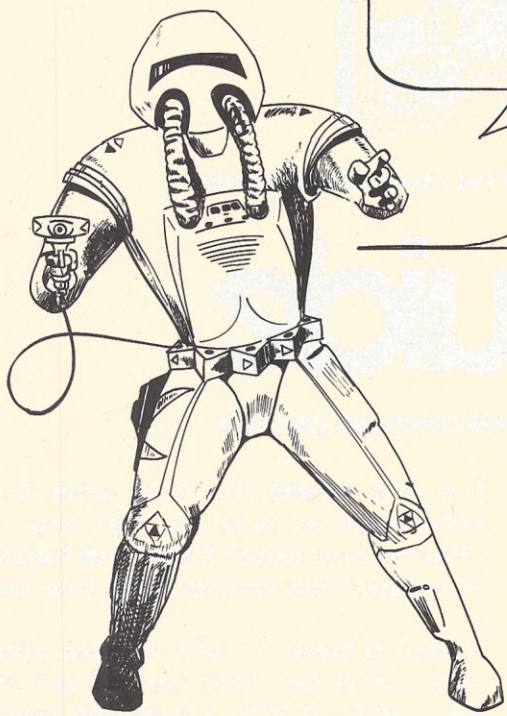

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4K-byte RAM buffer, is $2,100. A previously purchased M910A can be upgraded for $800. Pro-Log Corp., 2411 Garden Rd., Monterey, CA 93940, (408) 372-4593.
CIRCLE INQUIRY NO. 235

Data communications tester, Hawk 4020 is designed for field service use, combining features previously not available in a single compact test set. It performs interactive troubleshooting and passive monitoring of serial data associated with the EIA RS-232 digital interface. Data traffic is displayed on a one-line 20-character alphanumeric readout. Sophisticated interactive and monitoring functions are configured from a menu selection format that displays the various

system parameters. Features allow field service technicians to quickly isolate both simple and complex data communications problems. The unit can passively monitor and trap on-line data, perform a bit or block error rate test (BERT/BLERT), and simulate both data terminal and data communications equipment (DTE and DCE) to interactively communicate with both local and remote network components. Price: $3,595. International Data Sciences, 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200.
CIRCLE INQUIRY NO. 236

Stand-alone emulators support microprocessors in real-time. The EM-189 supports the Motorola 6809 series and the EM-149 supports the Intel 8048/8049/8050 family. The EM-series includes both emulators and logic state analyzer in one unit, providing simple system connection. Tract memory captures the last 255 qualified machine cycles in 32 bit words. The 8048 series unit also traces I/O port activity. A mapable overlay RAM allows quick program change and execution. An RS-232 port provides for connection to development systems, mini-

computers and CRT terminals. The emulators are used to improve the efficiency of many development systems. The EM-189 is priced at $3,295 base price for the emulator and logic state analyzer. The base price of the EM-149 is $4,395, including as standard the 4K byte overlay RAM. Applied Microsystems Corp., 11003 - 118th Place N.E., Kirkland, WA 98033, (206) 823-9911.
CIRCLE INQUIRY NO. 237

Mailing list system, Mail-M3, features a report writer that allows you to specify report formats and compatibility with the company's word processor program. It allows multiple labels (up to four) across a page, form input, a powerful report writer, fast multi-sort keys, duplicate label checking, random access and search. Screen input and edit features let you move the cursor, and delete characters and lines. This form processing capability turns a dumb terminal into an intelligent one. The system requires TRSDOS on the TRS-80 model III. An enhanced 48K version is priced at $79, while the 32K version is $59. Micro Architect, 96 Dothan St., Arlington, MA 02174, (617) 643-4713.
CIRCLE INQUIRY NO. 239

Sales tax calculator for models I and III TRS-80 simplifies tax calculations with all sale amounts entered at one time on the keypad. The program automatically separates entries coded taxable (on the keypad), calculates and displays the tax on the screen, and adds sales categories and tax due. The user may optionally enter tax actually charged on each sale, for states requiring reporting of tax charged as well as tax due by percentage. It will hold up to 500 entries in 16K, and 1,500 in 32K. It provides editing of entries immediately, during on-screen review, or from the menu. Edited entries and totals are shown corrected on the screen. A summary page is presented. Printout is

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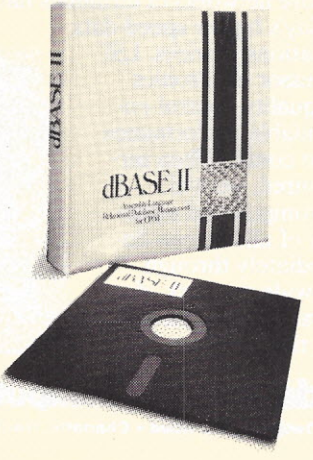

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supported, with summary and individual entries in page format for permanent record. All data may be dumped to tape and retrieved later for review if hard-copy storage is not desired. Price: $14.95. Manhattan Software, Box 1063, Woodland Hills, CA 91365, (213) 704-8495.
CIRCLE INQUIRY NO. 240

Financial software, the Software Fitness Program, is believed to be the first set of financial accounting programs available under one operating system that works on all Texas Instruments computers from the DS990 model I through the DS990 model 30. The program is designed for first-time computer users and includes sales order processing, accounts receivable with billing and sales analysis, accounts payable, general ledger, inventory, payroll and job cost. Features include open item and balance forward accounting: LIFO, FIFO and average cost methods of inventory valuation; financial statement report generator; revenue and expense accounting by job or phase; and on-line interactivity between all applications. Interface switches can be set by the user to control the complexity of the accounting interactions. Open Systems, Suite 409, 430 Oak Grove, Minneapolis, MN 55403, (612) 870-3515.
CIRCLE INQUIRY NO. 241

Word processing software, Magic Typewriter, is an all-purpose tool that eliminates the need for separate programs for separate tasks. Almost all commands are one word or mnemonics. The user has the ability to move blocks of text, selectively load or delete, find material from disk files without disturbing the file in memory, and swap charcter strings in one line, a block of lines, or throughout the entire text with a single command. As a database management system, the program allows the user to customize the system to his own needs simply by the format in which he enters his data. The system has an extremely rapid sort and can scan either an entire record or specific fields within a record. An entire file can be scanned in only a few seconds. It is extremely compact, using only 11K of the Z80 code. It is available for both CP/M and North Star DOS. Price: $175. California Digital Engineering, Box 526, Hollywood, CA 90028.
CIRCLE INQUIRY NO. 242

Five-function CRT seats are designed especially for data-terminal operators. The seating has been doctor-tested for ergonomic comfort, conforming and adjusting to the human body. They have pneumatic mechanisms operated by levers, which adjust the backs and seats to varying heights and

angles. These workstation chairs have a waterfall front and five star base. Users include IBM, Exxon, Kodak, Volkswagon, Audi, Porsche, Siemens, air-traffic controllers, doctors and many others. Charvoz-Carsen, Dept. CRT, 5 Daniel Rd. E., Fairfield, NJ 07006.
CIRCLE INQUIRY NO. 238

Cube game, Magikube, is a computer version of Rubik's cube. You have the option of scrambling the cube yourself or of several levels of scramble by the TRS-80 color computer. The objective is to restore the cube back to its original state. It uses the highest level of graphics and there is a tape save feature that allows you to save your cube and continue later. Price: $19.95. Computerware, Box 668, 1472 Encinitas Blvd., Encinitas, CA 92024, (714) 436-3512.
CIRCLE INQUIRY NO. 243

Star Warrior, a fast-action science fiction adventure, casts the player as an interplanetary avenger, who must single-handedly take on an entire planetary force of storm troupers and nine types of military vehicles. The player can walk, jump—or even fly—over swamps, forests and mountains. He is armed with sophisticated electronic direction finding equipment, decoys to fool the enemy, nuclear missiles, blaster and powergun. The game has 19 command options and five levels of skill, combined with sound effects and graphics display. It comes on a cassette or disk for the Atari 800 with 32K RAM. Price: $39.95. Automated Simulations, Box 4247, Mountain View, CA 94040.
CIRCLE INQUIRY NO. 244

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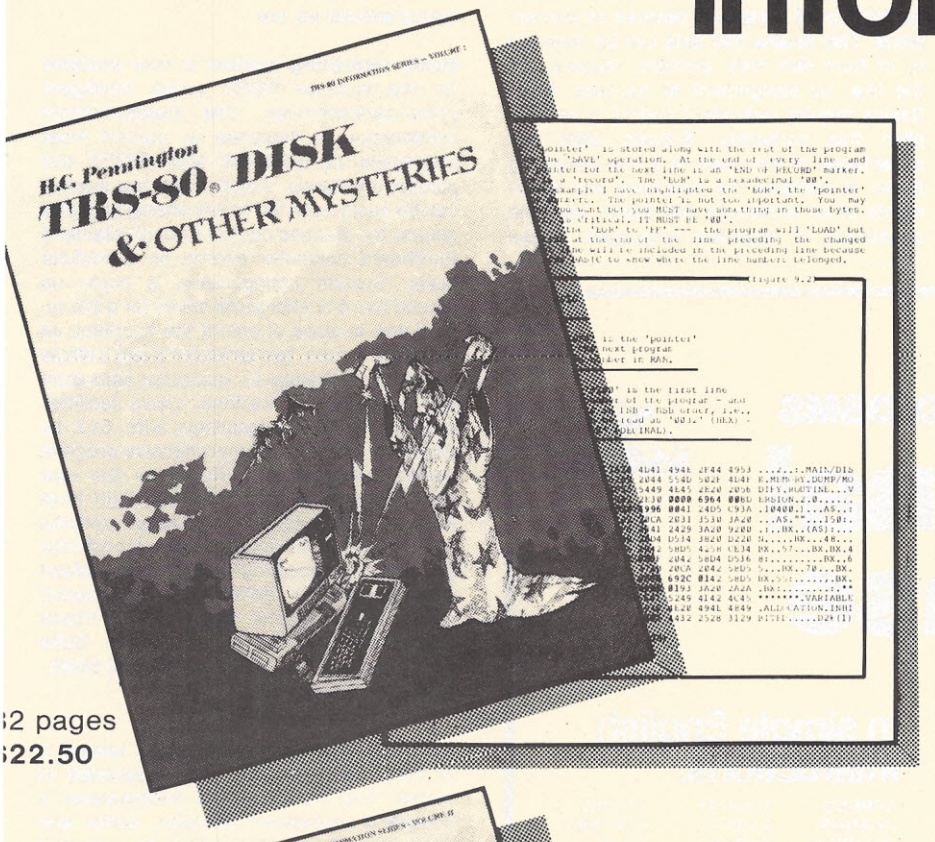

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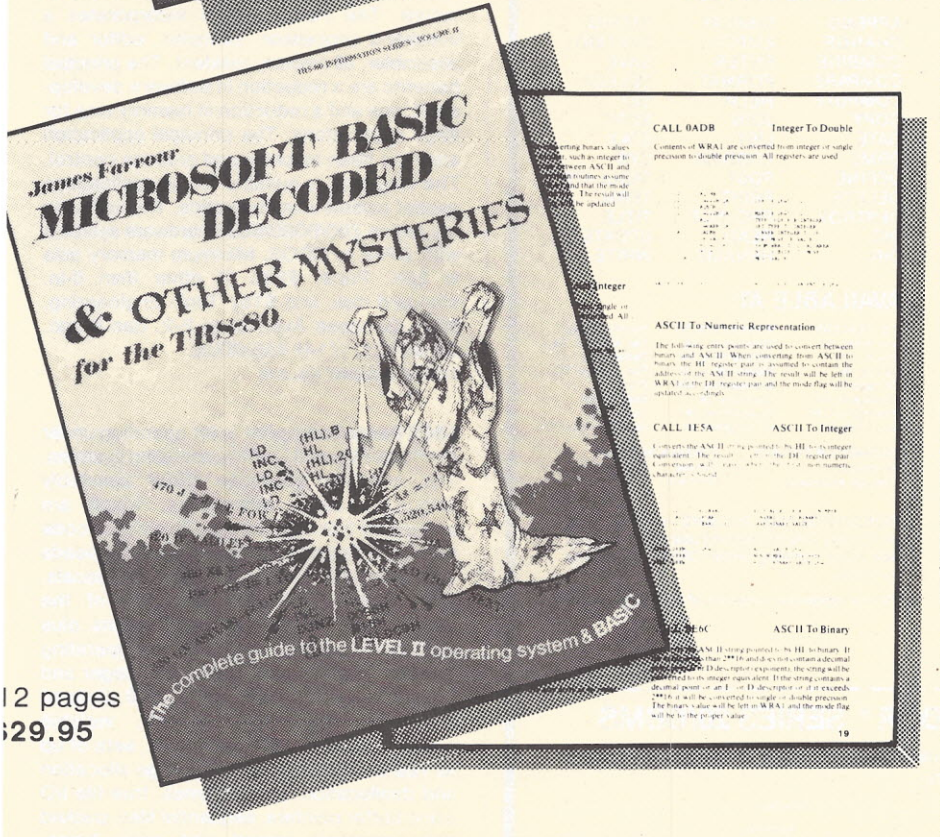

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Castle Wolfenstein, an action-adventure game, bridges the gap between arcade-type games and more complex adventure/fantasy games. The game delivers a combination of fast play and intellectual challenge. The scenario puts the player in the role of an Allied soldier as World War II rages across Europe. The castle itself is a magnificent Old World fortress that has been occupied by the army of the Reich and converted into battlefront headquarters. The player, who has been captured and brought to Castle Wolfenstein for interrogation, is secretly handed a fully-loaded stolen pistol by a dying cellmate. The player then assumes the game challenge: to find the Nazi war plans hidden in the castle and to escape without being recaptured or shot by the dreaded SS. The game requires an Apple II or II Plus with 48K, and disk drive running 3.2 or 3.3 DOS. Complete documentation is included in the $29.95 price. Muse Software, 330 N. Charles St., Baltimore, MD 21201.

CIRCLE INQUIRY NO. 245

Compiler software, S-Basic, version 5.4, adds the ability to read and write ASCII files as well as binary files. It also implements the declaration of peripheral devices as expressions. This means that data can be directed to or from disk files, printers, readers and the like, by assignment at run-time. Most Basics require redundant coding to accomplish this versatility. S-Basic adds the advantages of structure to a true compiling Basic. It contains the functions and statements of an enhanced disk Basic, plus the constructs of Algol-like languages. These include WHILE - DO, REPEAT - UNTIL, BEGIN - END, and CASE - SELECT. It provides FUNCTIONS and PROCEDURES that may be nested and called recursively. It also allows arrays and file buffers to be size dynamically (at run-time) and the chaining of programs with common variable passage. Price: $295. Micro-Ap, 7033 Village Parkway, Suite 206, Dublin, CA 94566.

CIRCLE INQUIRY NO. 246

Oasis operating system is now available for the Kontron PSI80 series intelligent computer/controller. The Oasis/Kontron combination is designed to control most processes via IEEE-488 bus, RS232 and parallel interfaces. Additionally, the system can be easily adapted to any analog or digital source for process control through standard Euroboard computer boards on a modular basis. System configuration is made up around two 5¼ Micropolis drives (or a 5¼-in. hard disk in place of one of the floppies), an 80 by 24 screen, two serial ports and a single parallel port. Popular for numerous laboratory and scientific applications, Oasis facilities enhance graphic capabilities with 512 by 256 pixel intensity. Comprehensive program development support offered by the new Oasis/Kontron system includes: high level Basic with compiler and interpreter; powerful EXEC job control language; text editors/script processor; relocating macro assembler/debugger/linkage editor; and diagnostic/conversion programs. Price: $500. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.

CIRCLE INQUIRY NO. 247

Software development system, release 3 of Forth, is interactive (conversational) in nature. The Forth system incorporates a command processor, compiler, editor and assembler, all memory resident. The principal benefits are a reduction in software development time and a reduction in memory size for large applications. The principal application area has been machine and process control. The language is suitable for all applications except scientific mathematics. The software will run on Z80/8080/8085 hardware systems with CP/M or CDOS. Minimum memory size is 28K. Price: $235 (if other than 8-in. standard disk, add $15). Timin Engineering, 9575 Genesee Ave., Suite E-2, San Diego, CA 92121, (714) 455-9008.

CIRCLE INQUIRY NO. 248

6809 Pascal compiler is for operation under the 6809 Flex and UniFlex operating systems. The compiler produces 6809 assembly language source mnemonics, which are assembled into object code. This native-code results in faster program execution speeds than common P-code interpreter Pascals. The compiler supports nearly all of the Jensen and Wirth Pascal specifications, plus additional features related to the operating system. The compiler supports: integer and floating point math with up to 16.8 digits of accuracy, scientific functions, variable names unique to 160 characters, sets of up to 128 elements, dynamic storage allocation and deallocation, pointer types, true file I/O using buffer pointers, sequential files, packed and unpacked record and array types, parameter passing from the command line to the Pascal program, and the ability to call other Pascal programs. The UniFlex version supports random access files. Additional

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operting system dependent routines exist for both the Flex and UniFlex versions of the compiler. Price for the Flex version is $200. A single CPU license for the UniFlex version costs $300 and includes one year of maintenance. Technical Systems Consultants, Box 2570, W. Layfayette, IN 47906, (317) 463-2502.
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Operating system, UCSD P-system version IV.0, allows users to run applications programs written for one microcomputer to run on another—often without recompilation. This protects software investments without restricting hardware options. This version features the same operating system and utilities for all the most popular micro processors (including the 8080, 8085, Z8, Z80, 6502, 6800, 6809, LSI-11, PDP-11, 9900 and soon the whole range of new 16 bit micros), and is fully supported to run on TRS-80 model II and Digital Equipment Corporation LSI-11 microcomputers. The package includes the complete operating system for microcomputers (with the user's choice of Pascal, Basic or Fortan compilers), a file handler, interpreter, editors (both screen and character oriented), a macro assembler, linker and documentation. Prices: $550 for Fortran or Pascal compilers; $450 for Basic. PCD Systems, Box 143, Penn Yan, NY 14527, (315) 536-3734.
CIRCLE INQUIRY NO. 250

Disk utility package, The Inspector, is for Apple computers. This ROM-based utility resides in memory location D8 and is accessible by a single command. Owners of Apple II + machines who do not have Integer Basic in ROM may purchase a disk version that will co-reside with INTBasic and load into a language expansion card. The utilities will allow the user to 1) repair blown disks, 2) map disk space, 3) search and edit a portion of or an entire disk for the appearance of a string, 4) search and edit a portion of or the entire RAM memory, 5) display all memory in Hex or ASCII. Also included is a USER exit that allows the use of subroutines supplied by the user to interface with The Inspector. These features allow the user to perform useful alterations to disks as well as memory. It is possible to read and rewrite sections of Random Access files or to reconstruct a Vtoc. Addition of normally unallowed line numbers into programs as well as multiple lines with the same number can be easily accomplished. The inspector makes input of quotation marks into PRINT statements possible where they are normally unavailable. Omega MicroWare, 222 S. Riverside Plaza, Chicago, IL 60606, (312) 648-1944.
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Real-time debugger for the Zilog and AMD Z8000 fully supports all the 32-bit expression handling capabilities of the Z8000. It also permits multiple segment addressing to a total memory space of 64K bytes. Future releases will offer extended memory capability. This makes it the most powerful debugging tool available anywhere for the Z8000. All BSO symbolic debuggers are highly advanced development tools that allow the evaluation and testing of a program in a completely protected software environment. The debugger works in real-time. The programmer, at any point in program execution, can learn the exact number of elapsed clock cycles to that point. Pipelining in BSO's SI/Z8000 is handled by clocking instructions when they're executed, not when they are Fetched. Users should be aware of potential inaccuracies in Z8000 debuggers that monitor only input pins and fetched instructions. Boston Systems Office, 469 Moody St., Waltham, MA 02154, (617) 894-7800.
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Pascal utility package, Pup-II, is designed specifically for the Apple Pascal 1.1 environment. The package moves Pascal text files to a Basic disk, and displays and modifies any byte from a Pascal or Basic disk. With Pup-II and its complementary package Pup-I, you can edit Basic programs with the Pascal editor, and use Basic communications programs to transfer Pascal files, and vice versa. Features include: supports Pascal wildcards; 40/80 column formats; upper and/or lower case; error-checking with understandable diagnostic messages; single or multi-drive operations; on-line user assistance; full user documentation; easy-to-use by Pascal beginners. Gryphon Microproducts, Box 6543, Silver Spring, MD 20906.
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Networking software, HiNet-2, provides networking management and data communications capabilities for the HiNet local computer network. The software permits the use of existing, single user CP/M 2.2 applications software on the network. A record-locking feature allows these CP/M application software programs to be converted for multi-user networking. The real time system

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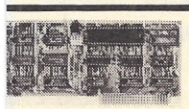

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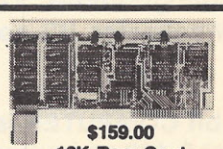

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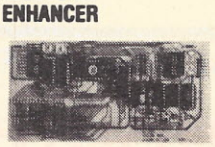

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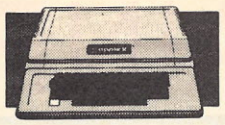

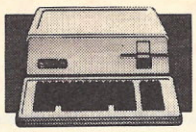

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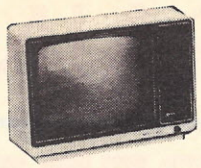

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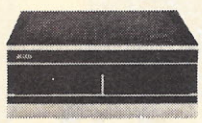

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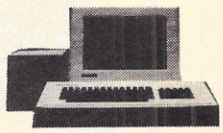

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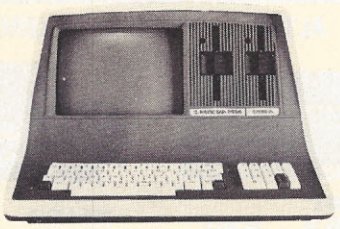

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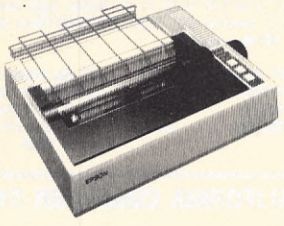

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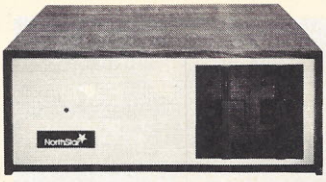

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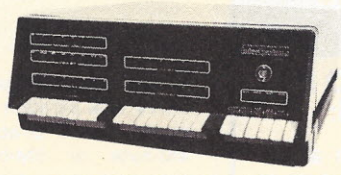

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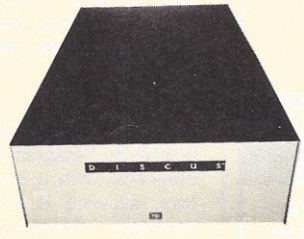

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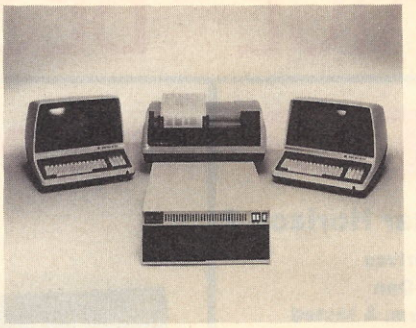


to 8M bytes. Single files may occupy an entire disk partition of up to 8M bytes with up to 1,024 directory entries on either 4M-byte or 8M-byte partitions. SDLC protocols are standard with proprietary, automatic error detection, correction, and resend for all network data communications. And HiNet's 1K read/write buffers minimize delays in hard disk access. Also featured is a print spooling utility. Digital Microsystems, 1840 Embarcadero, Oakland, CA 94606, (415) 532-3686.

CIRCLE INQUIRY NO. 254

Data communications package, Lync, is for CP/M and compatible operating systems and allows a computer to communicate with time-sharing systems or other computers that have Lync. In the computer-to-computer mode, both ends can type messages that appear simultaneously on both screens, view each other's directories and send or fetch data files. The package is able to reliably transfer files between systems, even over noisy phone lines, because of a unique automatic error detection and retry system. It has self generating I/O routines that require no patching. Required are CP/M, a CP/M derivative or CDOS, 16K RAM and 10K disk space. It can be supplied on most common disk formats. Price: $95. Computer-Aid, 1122 De La Vina, Santa Barbara, CA 93101.

CIRCLE INQUIRY NO. 255

Communications programs Micro-Courier and Micro-Telegram turn an Apple II personal computer into a powerful communications tool, allowing it to send many forms of business information from one Apple to another and to access Western Union communication lines. Micro-Courier is designed for professional use by businesses, managers and others who frequently require overnight or instant exchange of information. It allows an Apple II user to automatically transmit charts, graphs, correspondence, VisiCalc reports and entire programs to other Apple computers over standard phone lines. Micro-Telegram enables Apple owners to access Western Union services worldwide. Besides sending mailgrams at the lowest rates available, Apple owners can send and receive TWX, Telex and international Telex messages. Through Infomaster, the Western Union data base, Apple owners can also obtain continuously updated reports on news, stock, foreign exchange, gold and commodities futures. Each package is priced at $250. Apple Computer, 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.

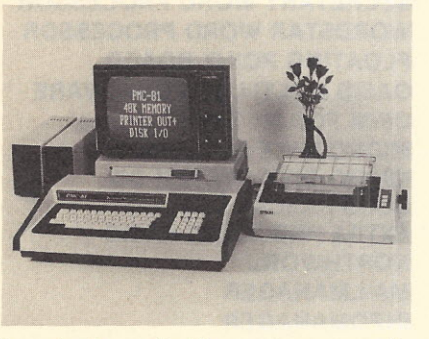
CIRCLE INQUIRY NO. 256

Business computer system YX-3200 is a 32K ROM/64K RAM (expandable to 72K ROM/128K RAM) unit that includes a central processing unit (CPU) with 20 user definable keys, green CRT display, two dual-sided, double-density floppy disk drives and an 80 cps bi-directional impact printer. Another option is an 8-in. double-sided, double-density floppy disk drive that stores over eight million bytes from eight drives; total

storage is four times the current half-million bytes available on 5¼-in. drives. A prototype color CRT is also on display. Other optional units include the CE-340R—an industry standard RS232C interface card that permits the YX-3200 to communicate between systems and to interface with standard industry peripherals. Price is under $6,000. Sharp Electronics Corp., 10 Keystone Place, Paramus, NJ 07652.

CIRCLE INQUIRY NO. 257

Personal microcomputer, the PMC-81, has 16K of memory, 14K of ROM, utilizes a Z80 microcomputer and provides a keyboard, cassette interface and video monitor inter-



face in the unit. The system uses the EXP-100 expander to add interfaces for minifloppy disks, printer, RS232C and S-100 bus. The PMC-81 has a 15 key numeric pad and four function keys. Additional features include automatic repeat on every key, print screen from keyboard command and shift lock command to switch the keyboard from Basic mode (all caps with shift to get lower case) to typewriter mode and back. Price: $740. Personal Micro Computers, 475 Ellis St., Mountain View, CA 94043, (415) 962-0220.

CIRCLE INQUIRY NO. 258

Microcomputer systems, Eagle 32 models 10 and 20, are similar except for quantity of mass storage available. Each has a 128K-byte main memory. The model 10 has a 1.6M-byte storage capacity expandable to 3.2M bytes on 5¼-in. floppy disk as compared with 2.4M-byte storage capacity, expandable to 4.8M bytes for the model 20. Both systems are expandable to 1M byte in main memory. All of memory is directly addressable by the

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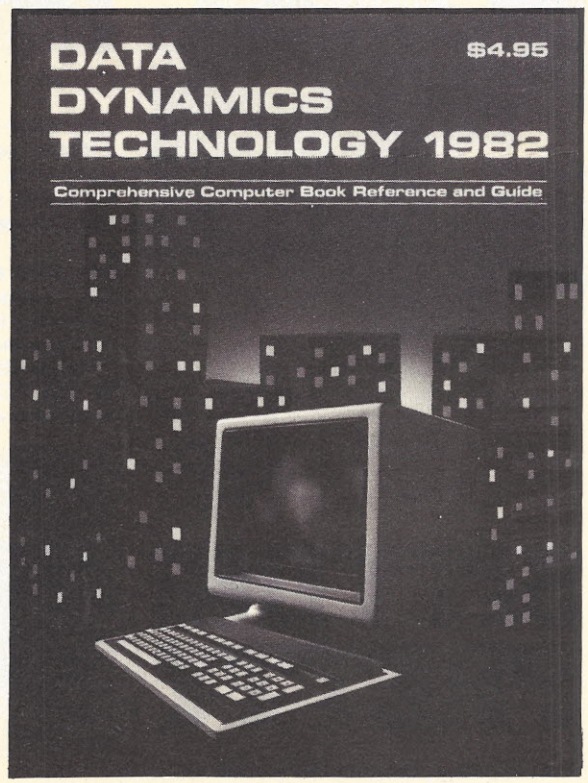

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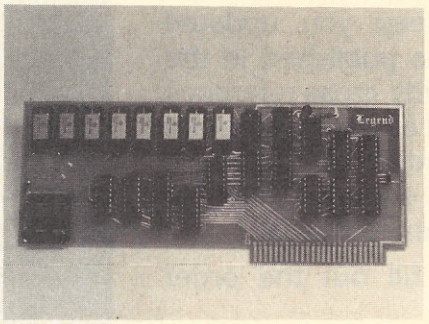
computer allowing large application programs to be executed in this system. Deliveries will include a batch operting system, Basic+, Forth+ and Tiny Fortran. The system comes standard with an 80 by 24 display, which has reverse video and flashing. A hard disk,

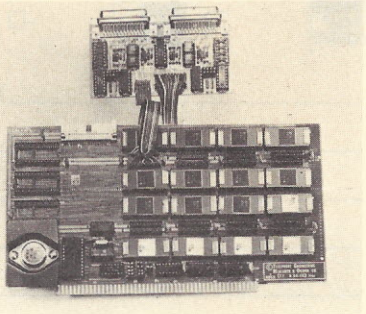
Winchester type, is offered in 10M-byte and 20M-byte versions. Prices start at $6,650. Computhink, 965 W. Maude Ave., Sunnyvale, CA 94086, (408) 245-4033.
CIRCLE INQUIRY NO. 259

64K RAM card for the Apple II computer uses Texas Instrument's TMs4164 RAM chips. The board gives the Apple the ability to access double its own RAM space by bank switching 16K banks of RAM over the Apple's existing ROM space. The board is fully compatible with the Apple language card and



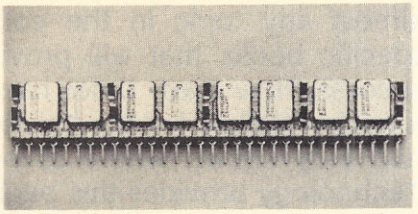
is configured to operate as four banks of language cards. RAS is taken directly from the Apple motherboard by removing a 4116 and inserting a DIP jumper into the vacant socket. The 4116 is reinserted onto the 64K card. Price: $349. Legend Industries, P.O. Box 112, Pontiac, MI 48056.
CIRCLE INQUIRY NO. 260

S-100 serial I/O board packs 16 duplex ports on one standard size board, taking just one S-100 motherboard slot. Each of the



ports can operate at any one of 16 internal baud rates. A small 4.5 in. by 2.5 in. board has two identical circuits for two duplex ports. Each circuit carries a turnover socket and some option plugs and connects to the S-100 board via a plug-terminated 20 conductor ribbon cable. The other side of the board has two standard 25 pin RS232 sockets to connect to the outside world in either RS232C or 20m/a mode. Telephone Enterprises, 1600 Fordham Ave., Thousand Oaks, CA 91360.
CIRCLE INQUIRY NO. 261

High density memory, the EDH-4816, is available as 16K by 8 or 128K by 1. The package requires only 0.66 in² of board space, one fifth the area of equivalent DIP memory. The package consists of eight industry standard 16K by 1 RAMs in chip carriers mounted on a 32 pin single in-line package (SIP). Since the high density memory uses standard chips, it has all standard operating modes. Access time is 200 nsec



and cycle time is 375 nsec. All supply voltages are decoupled on the SIP and are toleranced at ±10%. The device consumes 3.8W maximum active and 160mW stand by. Price: $59 each, in 100 quantities. Electronic Designs, 230 Eliot St., Ashland, MA 01721, (617) 881-5244.
CIRCLE INQUIRY NO. 264

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(Required by 39 U.S.C. 3685)

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Interface Age Magazine	
3. FREQUENCY OF ISSUE: monthly	A. NO. OF ISSUES PUBLISHED ANNUALLY: 12 — B. ANNUAL SUBSCRIPTION PRICE: $18.00
4. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, City, County, State and ZIP Code) (Not printers): 16704 Marquardt, Cerritos, L. A. County, California 90701	
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers): Same as Above	
6. NAMES AND COMPLETE ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR	
PUBLISHER (Name and Address): Melhotera, Wolfe & Jones 16704 Marquardt Ave. Cerritos, CA 90701	
EDITOR (Name and Address): Robert S. Jones 16704 Marquardt Ave. Cerritos, CA 90701	
MANAGING EDITOR (Name and Address): N/A	

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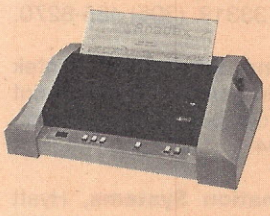

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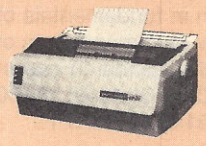

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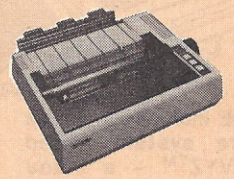

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Dec 4-6 National Careers for the Disabled Symposium, Convention Center, Baltimore, MD, lectures and discussions on new careers for the disabled in computer technology and other fields. David A. Kaminer, Commodore Business Machines, Computer System Div., 681 Moore Rd., King of Prussia, PA 19406, (215) 337-7100.

Dec 6-11 Muse N. American Annual Meeting, Bahia Mar Hotel and Yachting Center, Ft. Lauderdale, FL, ModComp Users Exchange featuring technical papers, workshops and user/manufacturer interface sessions on hardware and software. Kathy Hellstrom, ModComp Users Exchange, 4620 W. Commercial Blvd., Suite 6C, Tamarac, FL 33319, (305) 485-8270.

Dec 7-9 Advanced Programming Workshop, Wintek Corp., Lafayette, IN, hands-on training on the Wintek Sprint 68 development system and control computer. Wintek Corp., 1801 South St., Lafayette, IN 47904.

Dec 7-9 Conference on Information Systems, Hyatt Regency Hotel, Cambridge, MA, seminar sponsored by the Society for Management Information Systems and the Institute of Management Sciences, in cooperation with the Assoc. for Computing Machinery and the Assoc. for Systems Management. John Henderson, College of Business, Florida State U., Tallahassee, FL 32306.

Dec 7-11 Interactive Computer Graphics Workshop, Ohio State U., Columbus, OH, instruction in fundamentals of computer graphics, demonstration of how the components of a graphic system interrelate and extensive hands-on experience. Office of Continuing Education, Ohio State U., 2400 Olentangy Rd., Columbus, OH 43210, (614) 422-8571.

Dec 15-19 Gulf Computer Exhibition, Dubai International Trade Centre, United Arab Emirats, international computer companies exhibiting hardware and software. Audrey Flanangan, Public Relations Office, Box 9292, Dubai, United Arab Emirats.

Jan 7-10 Consumer Electronics Show, Convention Center, Hilton Hotel and Jockey Club, Las Vegas, NV, over 800 exhibitors of electronics equipment, along with conferences, workshops and seminars. Consumer Electronics Shows, Two Illinois Center, Suite 1607, 233 N. Michigan, Chicago, IL 60601.

Jan 14 Invitational Computer Conference, S. Coast Plaza Hotel, Orange County, CA, seminar/display directed exclusively to the needs of the quantity buyer of computer and peripheral equipment. Also held: Feb. 10, Pier 66 Hotel, Ft. Lauderdale, FL; Mar 23, Marriott Hotel, Dallas, TX; Mar 25, Adam's Mark Hotel, Houston, TX; and Apr 14, Sheraton Hotel, Southfield, MI. B.J. Johnson and Assoc., 2503 Eastbluff Dr., Suite 203, Newport Beach, CA 92660.

Jan 15-16 Math/Science Conference, Arizona State U., Tempe, AZ, workshops, demonstrations, and seminars on the microcomputer as a medium for instruction, a tool for research and an information manager. Nancy Watson, 203 Payne Hall, Arizona State U., Tempe, AZ 85287.

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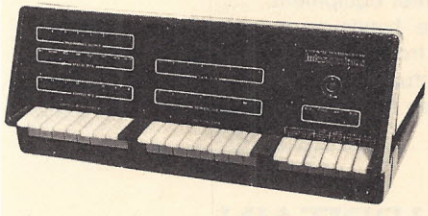

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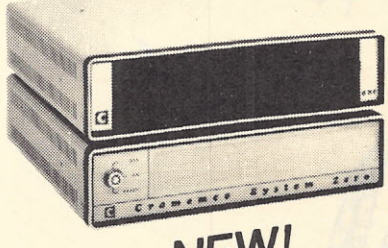

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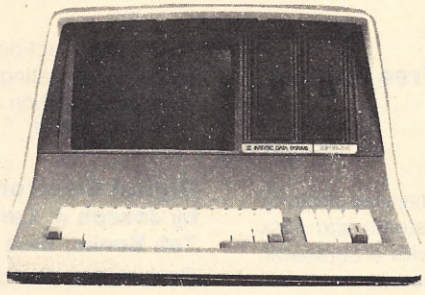

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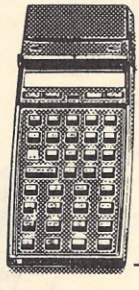

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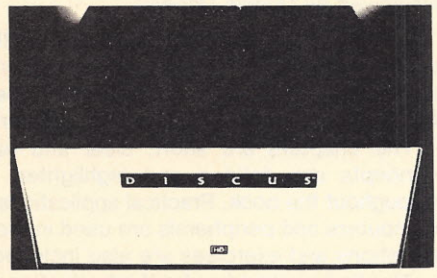

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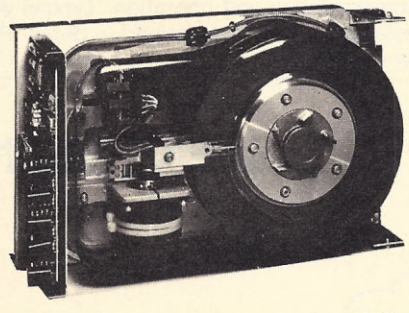

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BOOK REVIEWS

Introduction to Computers and Information Processing: Language Free Edition
by Don Cassel and Martin Jackson
Reston Publishing, Reston, VA

Reviewed by Dennis Doonan

This introduction to computers covers the major aspects of data processing by discussing computer systems and data processing in detail. It could be best used with a computer language text in an introductory computing course.

The chapters are short, clear and easy to follow. Key concepts are defined and highlighted in strategic spots throughout the book. Practical applications, illustrating current computers and peripherals are used in the examples. Review questions and exercises are also included.

The first section is a brief introduction to computers, their history and uses, number systems and a general description of a data processing system.

Computer hardware is featured next. Discussions include methods of data entry, input-output activities, storage devices, files and mini and micro computers.

This is followed by general concepts of computer programming. Problem solving methods are emphasized, rather than procedures in a specific high level language. Problem analysis, flowcharting and decision tables are introduced. The top-down method of programming is used.

A long section on systems analysis and design defines and explains the concept of a system from its design to its implementation and operation. Typical work performed by a systems analyst is described in detail. Practical applications are emphasized.

The final section deals with advanced concepts and applications. Operating systems, data communication and data base manipulation are discussed.

472 pages $17.95

Digital Electronics Troubleshooting
by Joseph J. Carr
Tab Books, Blue Ridge Summit, PA

Reviewed by David Civan

This book should prove popular, for it's a well-written guide to a perplexing subject. Most people are reasonably familiar with analog electronics, but troubleshooting expertise quickly vanishes when confronted with a digital circuit.

The book presents a wealth of information about its subject, but the information is organized well enough to prevent its being overwhelming. An occasional touch of humor saves the volume from tedium.

The reader is first introduced to digital electronics. A number systems and digital codes primer follows. Next come logic circuits and basic arithmetic circuits. The book moves swiftly from the abstract into the concrete, explaining such circuit components as nixie tubes and timers. Then it's into computers, with some general background and an in-depth look at the Z80 chip. Finally, the book concludes with sections on power supplies and test equipment.

Although considerable hands-on experience is probably vital for effective digital troubleshooting, this book should be good preparation for actual digital circuit work. And it has valuable information even for non-technicians.

352 pages $9.95

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AVAILABLE NOW ... SYSTEM 2800 FROM SYSTEMS GROUP

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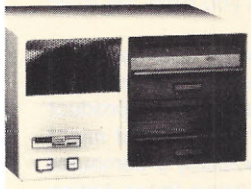

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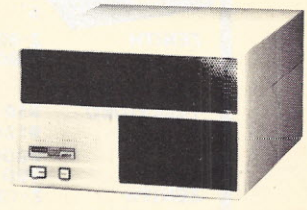

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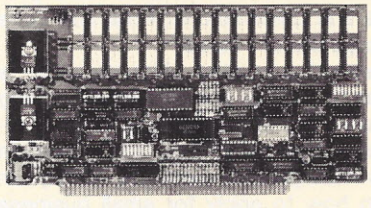

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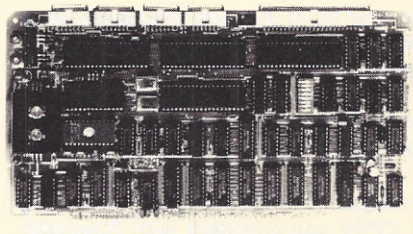

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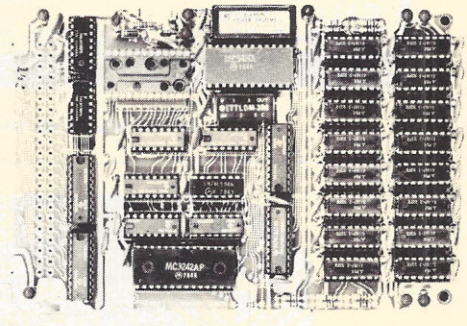

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BOOK REVIEWS

How to Make Money with your Microcomputer
by Carl Townsend and Merl Miller
Robotics Press, Portland, OR

Reviewed by James C. Graves, Jr.

Written in an easy-to-follow format, this book offers many helpful ideas for putting your microcomputer to work earning money.

The book begins with a discussion of basic writing techniques that will help you write and sell magazine articles. Twelve steps for preparing an article take you from the topic idea to the finished draft.

In dealing with the subjects of software and hardware development, the authors identify some available markets and how to approach them. They also offer some product possibilities and a business plan outline. Your interest might be to own a computer repair service or possibly a computer store. In either case, the chapters discussing these topics will be helpful.

Other sections cover such topics as establishing a business, a review or management principles and writing proposals to obtain business grants. The chapter on establishing a business introduces the three basic business structures: sole proprietorships, partnerships and corporations. Pros and cons on whether or not to incorporate are listed.

The chapter on management principles, although short, is very good. A manager does five things being listed as: setting objectives, organizing, motivating and communicating, monitoring and developing people. You are introduced to Abraham Maslow and twelve of his management concepts. Finally, an appendix gives details on how to apply for small business grants. An outline for writing a grant proposal is also included. Overall, the book is very informative.

154 pages $9.95

Pascal Programs for Scientists and Engineers
by Alan R. Miller
Sybex, Berkeley, CA

Reviewed by Rocky Smolin

Dr. Miller has compiled over 60 of the most frequently used scientific algorithms, along with their program implementations in Pascal. The purpose of the book, according to Miller, is twofold: to help the reader gain expertise in Pascal programming, and to present a library of programs used to solve some of the most frequently encountered problems in science and engineering.

The programs were developed on a Z80 microcomputer using the Lifeboat version of CP/M and compiled with Pascal/M. Most of the programs were also tested on other Pascal compilers—Pascal/MT, Pascal/Z and JRT Pascal on a DEC-20—to insure compatibility among several versions of Pascal.

The first chapter evaluates the strengths and weaknesses of commercially available Pascal compilers. Other chapters cover mean and standard deviation, vector and matrix operations, simultaneous solution of linear equations, development of a curve-fitting program, sorting, general least-squares curve-fitting, solution of equations by Newton's method, numerical integration and non-linear curve-fitting equations.

There is also a chapter on advanced topics—the normal curve, the Gaussian Error Function, the Gamma Function, and the Bessel Function. Miller has thoughtfully designed his programs with the features of Fortran, Basic and ALGOL in mind. Although this means not using some of the more elegant features of Pascal, his programs are readily converted to these other languages, further enhancing the book's value.

374 pages $16.95

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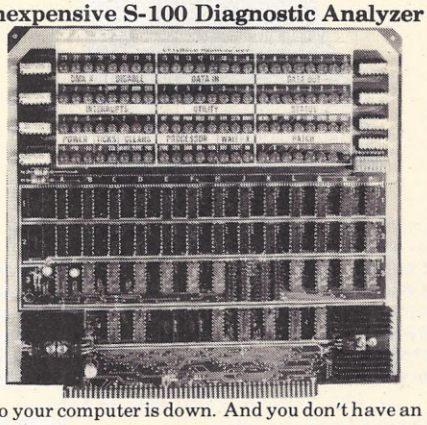

So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

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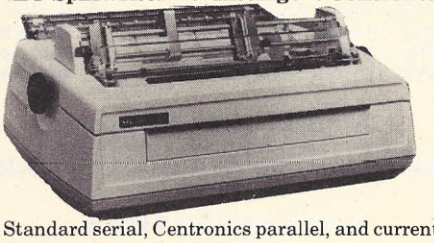

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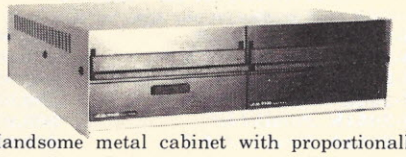

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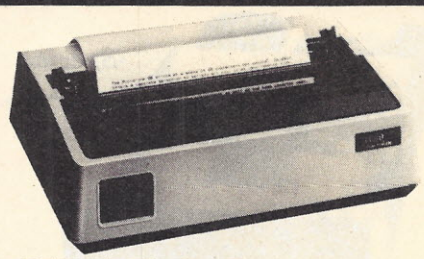

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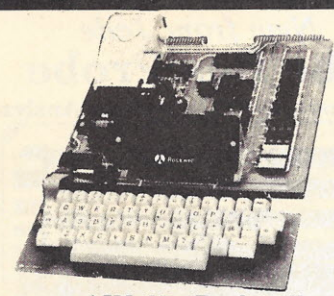

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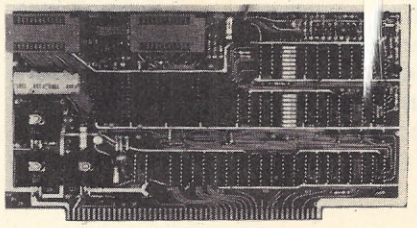

PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer

MEM-99510K *Kit* **$154.95**
MEM-99510A *A & T* **$219.95**

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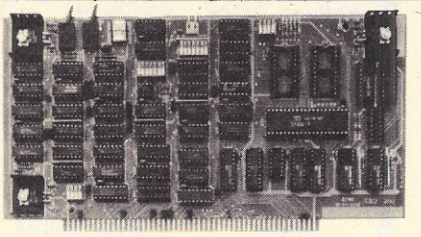
IOI-1010A *A & T* **$249.95**
IOI-1010B *Bare board* **$35.00**

S-100 CPU



CB-2 Z-80 CPU - S.S.M.

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K *Kit* **$239.95**
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Free Literature

Decision pamphlet identifies and describes the important features to consider when deciding upon a software tool to use for application system development. The features discussed include the richness of logical data structuring supported, control over data redundancy and data inconsistency, availability of high level query language, availability of programming language interfaces, mechanisms for data base recovery and restructuring, and portability of the software tool across machines and operating systems. Micro Data Base Systems, Box 248 Lafayette, IN 47902.

CIRCLE INQUIRY NO. 201

Superscore, a multi-purpose Cobol program generator for on-line programs, data base structures, batch applications and ad hoc reporting is described in manual. Using Superscore, Cobol programmers can produce standard, portable and easy-to-maintain Cobol code in a fraction of the time required to develop on-line programs. Users are protected against costly application conversions by the system's inherent ability to run on different hardware. SDA, 475 Park Ave. S., 26th Floor, New York, NY 10016.

CIRCLE INQUIRY NO. 202

IEEE 488 bus products are detailed in four-page, two-color brochure. The brochure discusses how the firm's line of interfaces, isolators, expanders, extenders and other components can be used to assist in mating instruments with controllers, computers or time-shared systems. Products also discussed include logic analyzers, event clocks as well as analog relay output units. ICS Electronics Corp., 1620 Zanker Rd., San Jose, CA 95112.

CIRCLE INQUIRY NO. 203

2114 static RAMs are described in data sheet. Included are the 2114, 2114-1 and the S2114 RAMs. The sheet lists the features and provides general descriptions of the 2114 RAMs, which are organized as 1024-words by 4-bit devices. A block diagram and specifications for specific access times along with recommended operating conditions, AC and DC operating characteristics, capacitance, absolute maximum ratings, diagrams for read and write cycles, and descriptive, functional and packaging information are also provided. GTE Microcircuits, 2000 W. 14th St., Tempe, AZ 85281.

CIRCLE INQUIRY NO. 204

Capacitor brochure details high-reliability discoidal multilayer ceramic capacitors (MLCs). This six-page two-color brochure describes AVX Ceralam discoidals, which are used as basic elements in radio frequency interference filters, commonly in ground-plane assemblies. The MLC discoidals are available in three types of dielectric: NPO, X7R and Z5U, providing three different temperature coefficients, and in a wide variety of sizes. Voltage ratings are 50, 100 or 200 volts dc. AVX Corp., Box 493, Olean, NY 14760.

CIRCLE INQUIRY NO. 205

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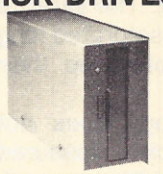

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Linking up for the Future— Microcomputers and Satellites

Continued from page 70

from outer space. In the next few years, many more businesses will come to rely on satellite communications.

The space shuttle may play a major role in this. At this writing, the shuttle, already almost fully scheduled for the next several years, is limited to flights no higher than about 150 miles. This is nowhere near the 22,300 miles from earth needed to place a satellite in geosynchronous orbit. However, small booster rockets can be built cheaply to lift communications satellites the final distance. Heavier, more powerful units will become a relatively inexpensive proposition. Someday shuttle-like craft will wander farther and more extensively in near space. In years to come, launching a communications "bird" will involve little more than renting space aboard a shuttle and asking the crew to toss it out the window at the appropriate spot.

Most Fortune 500 companies will be able to afford their own channels on such satellites, and possibly by mid-decade, much of the inter-office communication (both voice and computer) among the General Motors and Exxons of the world will be detoured nearly 45,000 miles. Look for some interesting changes in WATS line rate structures.

Even when such business communication becomes common for the big corporations, we will be a long way from bringing that sort of system to the small user. Putting up a satellite or two that can transmit signals to millions, or billions, of television receivers simultaneously is no great trick. But trying to replace our current telephone system with two-way, nationwide my-office-to-your-office satellite communications is a great deal more difficult. Given current technology, it would not take very long to fill up every available orbital slot, and occupy every usable frequency. The satellite communications network would become saturated long before the phone companies began rolling up their wires for salvage.

Fortunately, state-of-the-art technology does not remain static for long. Ultra high frequencies, measured in many gigahertz, may offer the bandwidth we need. Then, the receiving dishes that will already be in place nearly everywhere in the next few years can be augmented by transmitters that will make two-way communication possible.

At this point, it becomes practical for the microcomputer to become the telephone of tomorrow. The expanding number of workers performing tasks in decentralized or home offices will provide a foot in the door for the home computer that has been so widely predicted, but not widely adopted to date. As a telephone surrogate, low-end micros already cost little more than some of the fancier gadget-laden decorator telephones sold today. A microcomputer offers so much more, including the possibility of linking widespread offices as simply as if each manager or executive were only in the next room.

Far fetched? Not terribly. Much of the technology has already been developed. The space shuttle is flying. Microcomputers and the distributed office are a reality. We early users of microcomputers are destined to be remembered as pioneers of a basic business tool of the coming decades. □

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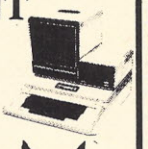

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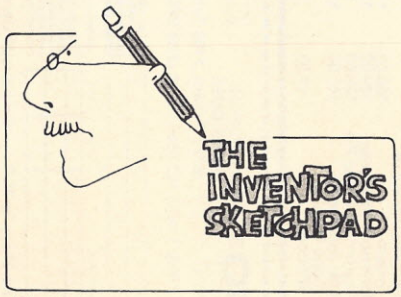
Inventor's Sketchpad

Continued from page 38



Listing

```
*/
/*

<<<<<<<<<<<<<<<<<<< general words >>>>>>>>>>>>>>>>>

*/

#define the
#define a
#define an
#define bits

/* <<<<<<<<<<<<<<<<< section dividers >>>>>>>>>>>>>>>> */

#define the_following_defines_the
#define function
#define end_function_definition

#define data_definitions
#define end_data_definitions

#define executeable_section  {
#define end_executeable_section  }

#define local_data_definitions
#define end_local_data_definitions

#define global_data_definitions
#define end_global_data_definitions

#define references_to_global_variables
#define end_references_to_global_variables


/* <<<<<<<<<<<<<<<<<< data definitions >>>>>>>>>>>>>>>>>> */

#define use_the_global extern
#define character char
#define integer int
#define floating_point float
#define real float
#define double_precision double

#define initialized_to

#define associate struct
#define with_the_following_structure {
#define end_structure_definition };
#define allocate struct
#define structure_to
#define end_allocation ;

/* <<<<<<<<<<<<<< assignment statements >>>>>>>>>>>>>>>>> */

#define set
#define equal_to =

/* <<<<<<<<<<< relational operators >>>>>>>>>>>>> */

#define is
#define equals ==
#define not_equal_to !=
#define greater_than >
#define less_than <
#define less_or_equal_to <=
#define equal_or_greater_than >=
#define and_also &&
#define or |
#define exclusively_orred_with ^
#define not !
#define complemented ~
#define left_shifted <<
#define right_shifted >>
#define bits

/* <<<<<<<<<<<< incrementing/decrementing >>>>>>>>>>>>>> */

#define increment ++
#define incremented ++
#define decrement --
#define decremented --

/* <<<<<<<<<<<< basic arithmetic operations >>>>>>>>>>>>>>>> */

#define plus +
#define minus -
#define multiplied_by *
#define times *
#define divided_by /
#define modulo %
#define negative -

/* <<<<<<<<<<<<<< pointers >>>>>>>>>>>>>>>> */

#define pointer *
#define address_of &
#define value_pointed_to_by *

/* <<<<<<<<<<<<<<< flow control operations >>>>>>>>>>>>> */
```

```
#define then {
#define or_if } else if
#define otherwise } else {
#define end_if }
#define exit break ;
#define do_the_following ) {
#define repeat_the_following ) {
#define end_repeating_section }
#define until while (!
#define as_long_as while (
#define forever while(1)
#define loop while(1) {
#define end_loop }
#define exit_from_this_loop break ;
#define match switch(
#define with ) { case
#define and_then : {
#define or_with } break; case
#define or_if_no_match_then } break; default:
#define end_matching }

/* <<<<<<<<<<< value returning functions >>>>>>>>>>>>>>>>>>>>>>>>> */

#define return_the_value return
#define to_the_invoking_routine ;
```

GO: A CP/M Program to Branch Anywhere in Memory

Continued from page 95

Program listing

```
                        TITLE   'GO (Jump anywhere)'
                ;
                ; Copyright 1981, by John Wiley & Sons, Inc.
                ;
                ; USAGE: TYPE GO F800 TO JUMP TO F800 HEX
                ;
0100            ORG     100H
                ;
0005 =          BDOS    EQU     5       ;DOS ENTRY POINT
005C =          FCB     EQU     5CH     ;FILE CONTROL BLOCK
0009 =          PBUF    EQU     9       ;PRINT BUFFER
000A =          RDBUF   EQU     10      ;READ CONSOLE BUFFER
000D =          CR      EQU     0DH     ;CARRIAGE RETURN
000A =          LF      EQU     0AH     ;LINE FEED
                ;
                START:
0100 215D00             LXI     H,FCB+1 ;GET ARGUMENT IF ANY
0103 7E                 MOV     A,M     ;FIRST BYTE
0104 FE20               CPI     ' '     ;BLANK?
0106 CA3B01             JZ      ERROR   ;NO ARGUMENT
0109 229B01     AGAIN:  SHLD    RBUFP   ;SAVE POINTER
010C CD1001             CALL    READHL  ;GET ADDRESS
010F E9                 PCHL            ;GO TO ADDRESS
                ;
                ; CONVERT ASCII-HEX CHARACTERS
                ; TO 16-BIT BINARY NUMBER IN H,L
                ;
0110 210000     READHL: LXI     H,0     ;START WITH 0
0113 CD6301     RDHL2:  CALL    GETCH   ;GET A BYTE
0116 FE20               CPI     ' '     ;END?
0118 C8                 RZ              ;YES
0119 CD2801             CALL    NIB     ;TO BINARY
011C DA3801             JC      RDHL4   ;NOT HEX
011F 29                 DAD     H       ;TIMES 2
0120 29                 DAD     H       ;TIMES 4
0121 29                 DAD     H       ;TIMES 8
0122 29                 DAD     H       ;TIMES 16
0123 B5                 ORA     L       ;COMBINE NEW
0124 6F                 MOV     L,A     ;PUT BACK
0125 C31301             JMP     RDHL2   ;NEXT
                ;
                ; CONVERT ASCII TO BINARY
                ;
0128 D630       NIB:    SUI     '0'     ;ASCII BIAS
012A D8                 RC              ; < 0
012B FE17               CPI     'F'-'0'+1
012D 3F                 CMC
012E D8                 RC              ; > F
012F FE0A               CPI     10
0131 3F                 CMC
0132 D0                 RNC             ;A NUMBER 0-9
0133 D607               SUI     'A'-'9'-1
0135 FE0A               CPI     10
0137 C9                 RET
                ;
                ; BLANK AT END OF LINE IS OK
                ; ELSE AN ERROR
                ;
0138 FEF0       RDHL4:  CPI     ' '-'0'
013A C8                 RZ
                ;
                ; IMPROPER ARGUMENT, TRY AGAIN
                ;
013B 117501     ERROR:  LXI     D,MESG  ;POINT TO MESSAGE
013E CD5901             CALL    PRINT   ;SEND IT
0141 119D01             LXI     D,RBUFM ;INPUT BUFFER
0144 CD5E01             CALL    READB   ;GET A LINE
0147 1600               MVI     D,0
0149 3A9E01             LDA     RBUFL   ;BUFFER LENGTH
014C 5F                 MOV     E,A
014D 219F01             LXI     H,RBUF
0150 19                 DAD     D       ;PAST BUFFER
0151 3620               MVI     M,' '   ;PUT IN BLANK
0153 219F01             LXI     H,RBUF
0156 C30901             JMP     AGAIN   ;TRY AGAIN
                ;
                ; PRINT CHARACTERS UNTIL $ IS FOUND
                ;
0159 0E09       PRINT:  MVI     C,PBUF  ;SET FOR PRINT
015B C30500             JMP     BDOS
                ;
                ; INPUT A LINE FROM CONSOLE
                ;
015E 0E0A       READB:  MVI     C,RDBUF ;READ INPUT BUFFER
0160 C30500             JMP     BDOS
                ;
                ; GET A CHARACTER FROM THE INPUT BUFFER
                ;
0163 E5         GETCH:  PUSH    H
0164 2A9B01             LHLD    RBUFP   ;GET POINTER
0167 7E                 MOV     A,M     ;GET NEXT CHAR
0168 23                 INX     H       ;INCREMENT POINTER
0169 229B01             SHLD    RBUFP   ;SAVE POINTER
016C FE61               CPI     'Z'+7   ;UPPER CASE?
016E DA7301             JC      GETC2   ;NO
0171 E65F               ANI     5FH     ;MAKE UPPER CASE
0173 E1         GETC2:  POP     H
```

```
0174 C9          RET
                 ;
                 MESG:
0175 474F206572  DB    'GO error. Input '
0185 7468652061  DB    'the address again.'
0197 0D0A2A24    DB    CR,LF,'*$'
                 ;
019B 9F01        RBUFF: DW    RBUF      ;BUFFER POINTER
019D 0A          RBUFM: DB    10        ;MAX SIZE
019E             RBUFL: DS    1         ;ACTUAL SIZE
019F             RBUF:  DS    1         ;INPUT BUFFER
                 ;
01A0                    END

Symbols

0109 AGAIN   0005 BDOS    000D CR      013B ERROR
005C FCB     0173 GETC2   0163 GETCH   000A LF
0175 MESG    0128 NIB     0009 PBUF    0159 PRINT
015B PRNT    019E RBUFL   019F RBUF    019D RBUFM
019B RBUFF   000A RDBUF   0113 RDHL2   013B RDHL4
015E READB   0110 READHL  0100 START
```

How to Recover Erased CP/M Files

Continued from page 98

Program listing

```
                ;       PROGRAM TO RECOVER ERASED FILE

0000 =          BOOT    EQU     0       ;CP/M WARM BOOT JUMP VECTOR
0005 =          BDOS    EQU     5       ;CP/M BDOS CALL JUMP VECTOR
005C =          FCB     EQU     BOOT+5CH ;DEFAULT FILE CONTROL BLOCK

0100                    ORG     100H    ;START AT BASE OF TPA
0100 C30002             JMP     STACK   ;GET AROUND THE STACK

0103 30         BLN     DB      48      ;48 IF CP/M 2.2, 42 IF CP/M 1.4
                                        ; BE SURE TO SUPPLY A
                                        ; SECTRAN ROUTINE IF 1.4

0104 0D0A554E45HMSG     DB      13,10,'UNERASE VERSION 1.0 (3/3/81) (CP/M VERSION $'
0132 322E32290DMSG22    DB      '2.2)',13,10,'$'
0139 312E34290DMSG14    DB      '1.4)',13,10,'$'

0200                    ORG     200H    ;GOOD PLACE TO START THE PROGRAM
0200 310002     STACK   LXI     SP, STACK       ;SET STACK POINTER
0203 CD1202             CALL    HELLO           ;SIGN ON MESSAGE
0206 CD1902             CALL    PCHECK          ;CHECK PARAMETERS
0209 CD2002             CALL    TRYFIX          ;DO THE RECOVERY
020C CD2A02             CALL    BYE             ;SIGN OFF MESSAGE
020F C30000             JMP     BOOT            ;RETURN TO CP/M

                ;  SAY WHO WE ARE
0212 110401     HELLO   LXI     D,HMSG          ;POINT TO HELLO MESSAGE
0215 CD7903             CALL    PRINT
0218 C9                 RET

                ;  CHECK FOR VALID PARAMETERS AND SAY WHICH CP/M VERSION
0219 CD4402     PCHECK  CALL    FCBCHK          ;MAKE SURE FILE SPECIFIED
021C CD6402             CALL    CPMCHK          ;ESTABLISH CP/M VERSION
021F C9                 RET

                ;  LOOKS THROUGH THE DIRECTORY TRYING TO MATCH FCB FILENAME
0220 CDD102     TRYFIX  CALL    NXTSECT         ;GET A DIRECTORY SECTOR
0223 C8                 RZ                      ;RETURNS ZERO FLAG IF NO MORE
0224 CDF302             CALL    CHKENT          ;CHECK IT OUT AND MAYBE FIX
0227 C32002             JMP     TRYFIX          ;KEEP IT UP TILL DONE

                ;  SIGN OFF AND RESET SYSTEM
022A 0E0D       BYE     MVI     C,13            ;SYSTEM RESET
022C CD0500             CALL    BDOS
022F 3AFC03             LDA     FIXCNT          ;CHECK FOR ACTIVITY
0232 B7                 ORA     A
0233 CA3D02             JZ      NOFIND          ;SAY NONE FOUND
0236 115204             LXI     D,BMSG          ;WARN FOUND
0239 CD7903             CALL    PRINT
023C C9                 RET
023D 11A204     NOFIND  LXI     D,NFMSG
0240 CD7903             CALL    PRINT
0243 C9                 RET

                ;  MAKES SURE A LEGAL FILENAME IS SPECIFIED
0244 3A5C00     FCBCHK  LDA     FCB             ;GET DRIVE SPECIFICATON
0247 B7                 ORA     A               ;SEE IF DEAFAULT
0248 C25102             JNZ     FCBCK1          ;NO, GO CHECK FILENAME
024B 0E19               MVI     C,25            ;ASK FOR CURRENT DRIVE
024D CD0500             CALL    BDOS
02A9 5E                 MOV     E,M             ;GET NUMBER OF
02AA 23                 INX     H               ; DIRECTORY ENTRIES
02AB 56                 MOV     D,M
02AC EB                 XCHG
02AD 23                 INX     H               ;ACCOUNT FOR - 1
02AE CD6E03             CALL    SHFTHL2         ;SHIFT HL RIGHT 2
02B1 7D                 MOV     A,L             ;GET NUMBER OF SECTORS
02B2 32F903             STA     DIRMAX          ;SAVE NUMB DIR SECS
02B5 210500             LXI     H,5             ;NOW POINT TO SYSTEM
02B8 19                 DAD     D               ; TRACK OFFSET
02B9 7E                 MOV     A,M             ;PICK UP NUMBER OF
02BA 32FA03             STA     TRACK           ;SAVE TRACK OFFSET
02BD 3E30               MVI     A,48            ;SET MOVE LENGTH
02BF 113201             LXI     D,MSG22         ;POINT TO 2.2 MSG
02C2 C9                 RET

                ;  GET BIOS JUMP VECTORS FOR EASY REFERENCE
02C3 2A0100     GETBIOS LHLD    BOOT+1          ;POINTS TO BIOS JUMP TABLE+3
02C6 119903             LXI     D,WBOOT         ;WHERE WE WILL KEEP A COPY
02C9 3A0301             LDA     BLN             ;NUMBER OF BYTES TO MOVE
02CC 47                 MOV     B,A             ;MOVE LIKES IT IN REG B
02CD CD6503             CALL    MOVE            ;MOVE THE TABLE
02D0 C9                 RET

                ;  READS NEXT SECTOR (GROUP OF 4 DIRECTORY ENTRIES)
                ;  RETURNS WITH ZERO FLAG SET IF NO MORE
02D1 3AF903     NXTSECT LDA     DIRMAX          ;SEE IF MORE SECTORS
02D4 B7                 ORA     A
02D5 C8                 RZ                      ;RETURNS ZERO FLAG IF NO MORE
02D6 3AFA03             LDA     TRACK           ;SET TRACK
02D9 4F                 MOV     C,A
02DA 0600               MVI     B,0
02DC CDB403             CALL    SETTRK
02DF 3AFB03             LDA     SECTOR          ;SET SECTOR
02E2 4F                 MOV     C,A
02E3 CD9003             CALL    TRANSLT
02E6 0600               MVI     B,0
02E8 CDB703             CALL    SETSEC
02EB CDBD03             CALL    READ            ;READ A SECTOR
02EE E601               ANI     1
02F0 EE01               XRI     1               ;REVERSE SENSE OF ERROR FLAG
02F2 C9                 RET                     ;RETURNS WITH ZERO FLAG SET
                                                ;  IF BAD READ

                ;  CHECKS THE CURRENT 4 DIRECTORY ENTRIES AGAINST ARGUMENT
                ;  IF MATCH, REWRITES SECTOR WITH REACTIVATED 1ST BYTES
02F3 AF         CHKENT  XRA     A               ;ASSUME NO REWRITE
02F4 32FD03             STA     REWRT
02F7 0604               MVI     B,4             ;NUMBER OF ENTRIES PER SECTOR
02F9 218000             LXI     H,80H           ;BEGINNING OF BUFFER
02FC 7E         CKLUP   MOV     A,M
02FD FEE5               CPI     0E5H            ;CHECK FOR UNUSED
02FF C21803             JNZ     CKINC
0302 E5                 PUSH    H               ;SAVE BEGINNING ADDR
0303 CD5203             CALL    COMPAR          ;COMPARE WITH ARGUMENT
0306 E1                 POP     H
0307 C21803             JNZ     CKINC           ;NO MATCH
030A 3600               MVI     M,0             ;RESET FLAG FOR ACTIVE
030C 3E0F               MVI     A,0FH           ;SAY NEEDS REWRITE
030E 32FD03             STA     REWRT
0311 3AFC03             LDA     FIXCNT

0314 3C                 INR     A               ;BUMP COUNT OF CHANGES
0315 32FC03             STA     FIXCNT
0318 112000     CKINC   LXI     D,32            ;LENGTH OF ENTRY
031B 19                 DAD     D
031C 05                 DCR     B
031D C2FC02             JNZ     CKLUP
0320 3AFD03             LDA     REWRT           ;SEE IF NEED REWRITE
0323 B7                 ORA     A
0324 CA4303             JZ      CKDONE          ;NO - DONE
                ;  WRITE THE DIRECTORY SECTOR BACK TO THE DISK
0327 3AFA03             LDA     TRACK           ;SET TRACK
```

```
0250 3C              INR     A              ;OFFSET FOR NEXT INSTR
0251 3D      FCBCK1  DCR     A              ;CURRECT DRIVE NUMBER
0252 325C00          STA     FCB            ;SAVE IT
0255 3A5D00          LDA     FCB+1          ;GET 1ST BYTE OF FILENAME
0258 FE20            CPI     ' '            ;MAKE SURE IT IS NON BLANK
025A D0              RNC                    ;OK - KEEP GOING
                 IF NO FILE NAME IS SPECIFIED, ABORT WITH NOTICE
025B 118104          LXI     D,NOFMSG
025E CD7903          CALL    PRINT
0261 C30000          JMP     BOOT           ;ABORT

                 ; CHECKS FOR CP/M VERSION AND SETS THINGS
0264 118000  CPMCHK  LXI     D,80H          ;SET DMA TO TBUFF
0267 0E1A            MVI     C,26
0269 CD0500          CALL    BDOS
026C 0E0C            MVI     C,12           ;VERSION NUMBER REQUEST
026E CD0500          CALL    BDOS
0271 FE20            CPI     20H            ;EARLIER THAN 2.2?
0273 3E2A            MVI     A,42           ;ASSUME 1.4
0275 113901          LXI     D,MSG14        ;POINT TO 1.4 MSG
0278 D4A002          CNC     CPM22          ;IF 2.2 GO SET THINGS
027B 320301          STA     BLN            ;SET THE MOVE LENGTH
027E CD7903          CALL    PRINT
0281 CDC302          CALL    GETBIOS        ;ESTABLISH BIOS JUMP VECTOR
                 SELECT DISK AND SETUP DISK PARAM HEADER
0284 3A5C00          LDA     FCB            ;GET THE DISK
0287 4F              MOV     C,A
0288 0600            MVI     B,0
028A CDB103          CALL    SELDSK         ;MAKE SURE DRIVE IS
028D 7C              MOV     A,H            ;SELECTED
028E B5              ORA     L
028F CA7E03          JZ      ILDISK
0292 3A0301          LDA     BLN
0295 FE30            CPI     48             ;IF CP/M 1.4 SKIP-REST
0297 D8              RC
0298 5E              MOV     E,M            ;GET THE ADDRESS
0299 23              INX     H              ; OF THE XLTO
029A 56              MOV     D,M
029B EB              XCHG
029C 22CF03          SHLD    DPH            ;SAVE THE ADDRESS
029F C9              RET

                 ; IF CP/M 2.2 DETERMINE NUMBER OF DIRECTORY ENTRIES ALSO
02A0 0E1F    CPM22   MVI     C,31           ;GET DISK PARMS ADDRESS
02A2 CD0500          CALL    BDOS           ;DPB ADDR IN HL ON RET
02A5 110700          LXI     D,7            ;OFFSET TO DRM
02A8 19              DAD     D
```

```
032A 4F              MOV     C,A
032B 0600            MVI     B,0
032D CDB403          CALL    SETTRK
0330 3AFB03          LDA     SECTOR         ;SET SECTOR
0333 4F              MOV     C,A
0334 CD9003          CALL    TRANSLT
0337 0600            MVI     B,0
0339 CDB703          CALL    SETSEC
033C CDC003          CALL    WRITE          ;WRITE THE SECTOR BACK
033F B7              ORA     A              ;ABORT IF ERROR
0340 C28703          JNZ     ERRWRT
0343 3AF903  CKDONE  LDA     DIRMAX
0346 3D              DCR     A              ;REDUCE SECTORS LEFT
0347 32F903          STA     DIRMAX
034A 3AFB03          LDA     SECTOR         ;POINT TO NEXT SECTOR
034D 3C              INR     A
034E 32FB03          STA     SECTOR
0351 C9              RET

                 COMPARE 11 BYTES OF DIRECTORY ENTRY AGAINST ARGUMENT
0352 23      COMPAR  INX     H
0353 115D00          LXI     D,FCB+1
0356 EB              XCHG
0357 0E0B            MVI     C,11
0359 1A      CMPR1   LDAX    D              ;GET DIR ENT CHAR
035A E67F            ANI     7FH            ;STRIP ANY FLAGS
035C BE              CMP     M
035D C0              RNZ                    ;DONE IF NO MATCH
035E 13              INX     D
035F 23              INX     H              ;BUMP TO NEXT CHAR
0360 0D              DCR     C
0361 C25903          JNZ     CMPR1          ;LOOP FOR 11 CHAR
0364 C9              RET                    ;RETURNS ZERO FLAG SET FOR MATCH

             ; GENERAL PURPOSE MOVE ROUTINE.
             ;   FROM (HL) TO (DE) FOR COUNT OF B
0365 7E      MOVE    MOV     A,M            ;GET A BYTE
0366 12              STAX    D              ;PUT A BYTE
0367 13              INX     D              ;INCREMENT TO NEXT
0368 23              INX     H
0369 05              DCR     B              ;COUNT DOWN
036A C26503          JNZ     MOVE
036D C9              RET

             ; SHIFT REGS HL RIGHT 2 BITS LOGICAL
036E CD7103  SHFTHL2 CALL    SHFTHL
```

```
0371 AF       SHFTHL  XRA     A               ;CLEAR CARRY
0372 7C               MOV     A,H
0373 1F               RAR                     ;SHIFTED BIT IN CARRY
0374 67               MOV     H,A
0375 7D               MOV     A,L
0376 1F               RAR
0377 6F               MOV     L,A
0378 C9               RET

                ; GENERAL PRINT ROUTINE ENTER WITH REG DE POINTING TO MSG
                ; RETURNS TO CALLER FROM BDOS
0379 0E09       PRINT   MVI     C,9             ;BDOS PRINT STRING COMMAND
037B C30500             JMP     BDOS            ;GO DO THE PRINT

                ; SPECIFIED AN ILLEGAL DISK DRIVE - ABORT
037E 112804     ILDISK  LXI     D,ILMSG
0381 CD7903             CALL    PRINT
0384 C30000             JMP     BOOT            ;ABORT

                ; ERROR OCCURED DURING DISK WRITE - ABORT
0387 11FE03     ERRWRT  LXI     D,WMSG
038A CD7903             CALL    PRINT
038D C30000             JMP     BOOT            ;ABORT

                ; TRANSLATE REG C FROM LOGICAL TO PHYSICAL SECTOR NUMBER
0390 2ACF03     TRANSLT LHLD    DPH             ;GET ADDRESS OF XLT0
0393 EB                 XCHG
0394 CDC603             CALL    SECTRAN
0397 4D                 MOV     C,L
0398 C9                 RET

                ;
                ; THIS IS THE WORKING COPY OF THE BIOS JUMP TABLE
                ; IF CP/M 2.2, NO CHANGES ARE NECESSARY
                ; IF CP/M 1.4, SECTRAN IS NOT COPIED FROM BIOS
                ;               BE SURE TO CORRECT THE INCLUDED
                ;               VERSION FOR YOUR OWN DISK SYSTEM
                ;
0399            WBOOT   DS      3
039C            CONST   DS      3
039F            CONIN   DS      3
03A2            CONOUT  DS      3
03A5            LIST    DS      3
03A8            PUNCH   DS      3
03AB            READER  DS      3
03AE            HOME    DS      3
03B1            SELDSK  DS      3

03B4            SETTRK  DS      3
03B7            SETSEC  DS      3
03BA            SETDMA  DS      3
03BD            READ    DS      3
03C0            WRITE   DS      3
03C3            LISTST  DS      3
03C6 C3C903     SECTRAN JMP     STRAN

                ; SECTOR TRANSLATION ROUTINE FOR
                ; CP/M VERSIONS EARLIER THAN 2.0
                ; REG DE CONTAINS ADDRESS OF XLT0
                ; REG BC CONTAINS THE LOGICAL SECTOR NUMBER
                ;
                ; RETURNS PHYSICAL SECTOR NUMBER IN REG HL
03C9 0600       STRAN   MVI     B,0
03CB EB                 XCHG
03CC 09                 DAD     B
03CD 6E                 MOV     L,M
03CE C9                 RET

                ; ADDRESS OF TRANSLATE TABLE
03CF DF03       DPH     DW      XLT0
03D1                    DS      14

                ; THIS IS THE STANDARD TRANSLATE TABLE
03DF 01070D1319XLT0     DB      1,7,13,19,25,5,11,17,23,3,9,15,21
03EC 02080E141A         DB      2,8,14,20,26,6,12,18,24,4,10,16,22

                ; WORKING STORAGE FOLLOWS

03F9 10         DIRMAX  DB      16              ;NUMBER OF SECTORS IN DIRECTORY =
                                                ;MAXIMUM NUMBER OF DIRECTORY ENTRIES
                                                ; DIVIDED BY 4 (ENTRIES PER SECTOR)

03FA 02         TRACK   DB      2               ;TRACK NUMBER OF DIRECTORY
03FB 00         SECTOR  DB      0               ;CURRENT SECTOR NUMBER

03FC 00         FIXCNT  DB      0               ;NUMBER OF ENTRIES FIXED
03FD 00         REWRT   DB      0               ;REWRITE FLAG 0=NO, F=YES

03FE 0A0D455252WMSG     DB      10,13,'ERROR OCCURED DURING DISK WRITE - ABORT$'
0428 0A0D535045ILMSG    DB      10,13,'SPECIFIED AN ILLEGAL DISK DRIVE - ABORT$'
0452 0A0D524543BMSG     DB      10,13,'RECOVERED - PLEASE DOUBLE CHECK BEFORE USING$'
0481 0A0D4E4F20NOFMSG   DB      10,13,'NO FILE NAME SPECIFIED - ABORT$'
04A2 0A0D46494CNFMSG    DB      10,13,'FILE NOT FOUND$'
04B3                    END     100H
```

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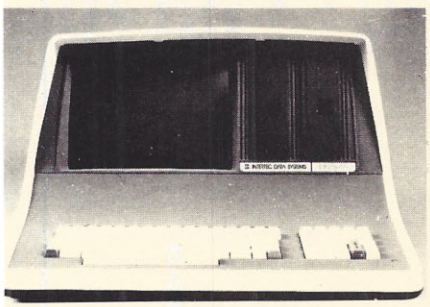

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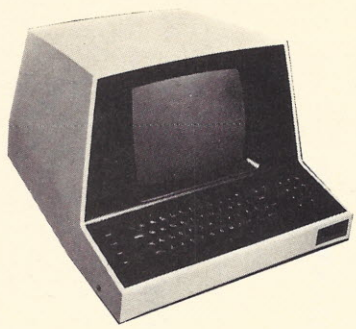

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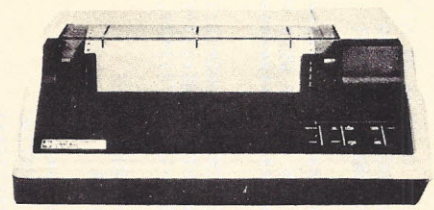

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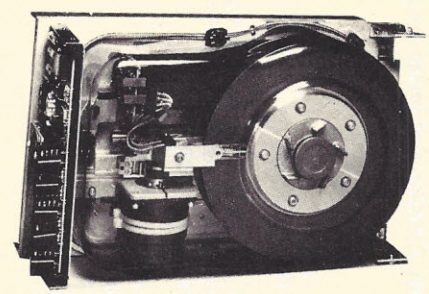

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Calendar Program *Continued from page 100*

Program listing

```
280     U1$="|":
        U$=STRING$(78,"-"):
        CLEAR.SCREEN$=CHR$(27)+"L"      ' IBM 3101
290 '
300 DATA SUNDAY,MONDAY,TUESDAY,WEDNESDAY,THURSDAY,FRIDAY,SATURDAY
310 DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,SEPTEMBER
320 DATA OCTOBER,NOVEMBER,DECEMBER
330 '
340 '   *****************
        READ DAYS OF WEEK
        *****************
350     FOR Z%=1 TO 7:
           READ DAY$(Z%):
        NEXT
360 '
370 '   ************
        SETUP SCREEN
        ************
380 PRINT CLEAR.SCREEN$:
    PRINT TAB(4)"APPLIED BUSINESS SOFTWARE - (213) 679-0651":
    PRINT TAB(4)"VERSION  2.0  -  CALENDAR":
    PRINT:PRINT
390 '
400 '   ***************************
        REQUEST DATA FROM OPERATOR
        ***************************
410 PRINT TAB(4);:INPUT "ENTER MONTH,YEAR : ",M%,Y%
420 YEAR%=Y%
430 '
440 '   **********
        READ MONTH
        **********
450     RESTORE 310
460     FOR Z%=1 TO M%:
           READ MONTH$:
        NEXT
470 '
480     IF M%<>2 THEN 560       '  FEBRUARY?
490 '
500 '   ****************************************
502     LEAP YEAR ARE THOSE DIVISABLE BY FOUR
        EXCEPT CENTESIMAL YEARS WHICH ARE COMMON
        UNLESS DIVISABLE BY 400
        ****************************************
510     IF Y%/4<>INT(Y%/4) THEN MONTH.END%=28:GOTO 590
520     MONTH.END%=29
530     IF Y%/100=INT(Y%/100) AND Y%/400<>INT(Y%/400) THEN MONTH.END%=28
540     GOTO 590
550 '
560 '   ******************************
        IF NOT FEBRUARY 30 OR 31 DAYS?
        ******************************
570     IF (M%=4 OR M%=6 OR M%=9 OR M%=11)
           THEN MONTH.END%=30
           ELSE MONTH.END%=31
580 '
590 '   **********************************
        CALCULATE DAY OF WEEK MONTH STARTS
        **********************************
600 D%=1                        ' ASSUME FIRST DAY OF MONTH
610     IF M%<3 THEN M%=M%+12:Y%=Y%-1
620 N%=D%+2*M%+INT(.6*(M%+1))+Y%+INT(Y%/4)-INT(Y%/100)+INT(Y%/400)+2:
    N%=INT((N%/7-INT(N%/7))*7+.5)
630 '
640     IF N%=0 THEN N%=7
650     DAY%=1-N%               ' WHEN 0 START PRINTING NUMBERS IN SQUARES
660 '
670 '   **************
        START PRINTING
        **************
680 '
690 PRINT CLEAR.SCREEN$;
700 '
710 '   ******************
        PRINT DAYS OF WEEK
        ******************
720 FOR COL%=1 TO 7:
       PRINT TAB(3+(COL%-1)*11) DAY$(COL%);:
    NEXT:
    PRINT TAB(2) U$
730 '
740 FOR ROW%=1 TO 6:
        FOR COL%=1 TO 7:
          DAY%=DAY%+1:
          PRINT TAB(2+(COL%-1)*11) U1$;:
          IF DAY%>MONTH.END% OR DAY%<=0 THEN 760
750       PRINT DAY%;
760     NEXT:
        PRINT TAB(79) U1$
770 '
780 '   ****************************************
        LOOP NUMBER OF EXTRA U1$ AFTER NUMBER LINE
        ****************************************
790     FOR Z1%=1 TO 2:

            FOR COL%=1 TO 8:
                PRINT TAB(2+(COL%-1)*11) U1$;:
            NEXT COL%:
             PRINT:
        NEXT Z1%:
        PRINT TAB(2) U$:
        IF (DAY%=>MONTH.END% AND ROW%=5) THEN 820
800 NEXT ROW%
810 '
820 PRINT TAB(2) MONTH$ " -" YEAR%  TAB(60)"PRESS RETURN . . . ";:
    X0$=INPUT$(1):
    GOTO 370
```

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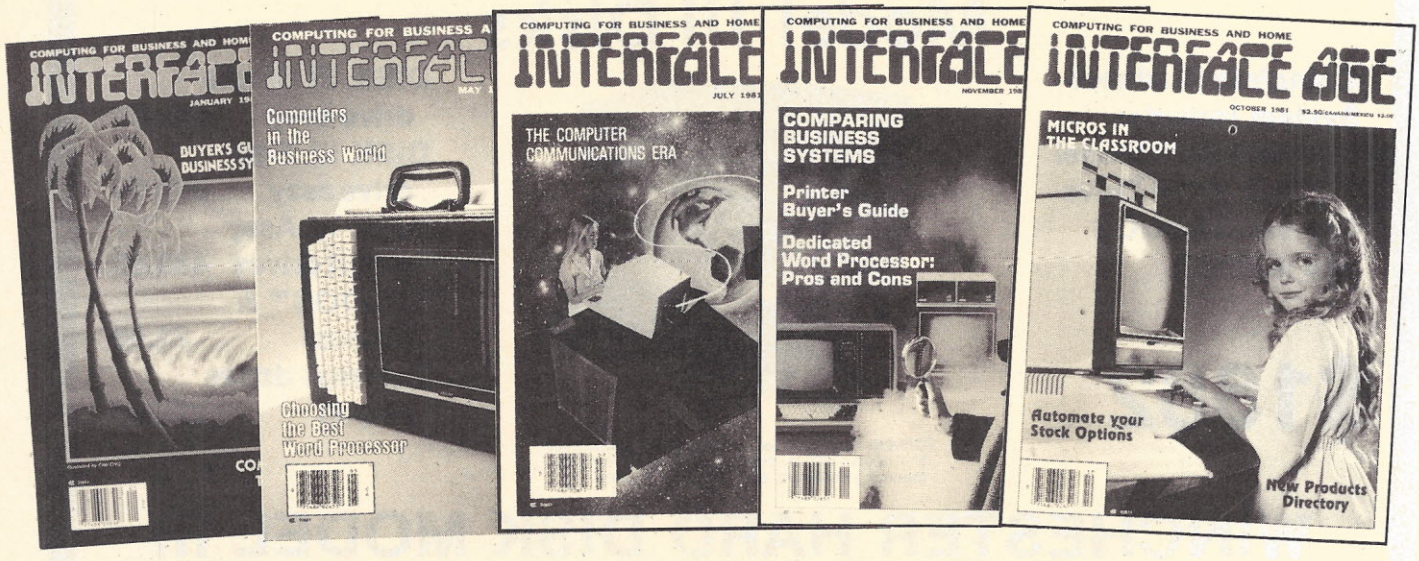

Throughout 1981, *Interface Age* made a stronger commitment than ever to emphasize the business applications end of the vast microcomputing field. Our editorial thrust decidedly leans towards practicality and away from hobbyist pursuits. At a glance, this theme is immediately apparent among the subjects listed in this year's index: legal and medical office procedures, business hardware and software, accounting, inventory control and miscellaneous office functions. At the same time, we have not completely disregarded useful applications that fall outside a strict business category: educational, personal computing, programming, language tips and consumer advice.

Among the most popular features were the comparison articles on software, hardware and various computer paraphernalia and services. 1981 issues included a record number of these and we will follow through with this trend during 1982. Tom Fox's March article "Computers by Mail" sparked an interesting controversy on the issue of mail order vs. computer store purchase options. Fox's articles on his Prime Number Cruncher method of benchmark testing also generated a landslide of responses from readers who ran his test on their own machines.

Since the purpose of this index is to catalog a wide array of topics within a limited space, it is subject-oriented, rather than by article title. All topics covered in 1981—regular monthly columns, features, editorials and book reviews—are included. Hardware and software reviews are alphabetized by the manufacturer's name, rather than the product name. Whenever applicable, cross-referencing is utilized.

BOOK REVIEWS

BUSINESS APPLICATIONS

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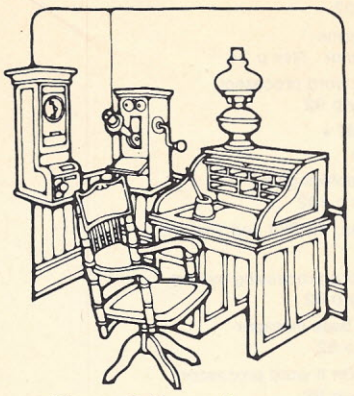
MATHEMATICS



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INTERFACE AGE is seeking articles on the versatile computer—devices that can be used for both business and personal use—for the May 1982 issue. Hardware-related articles are of interest, as well as applications articles on personal computing, educational software for home use, and both practical and entertainment-oriented home programs. Articles intended for this issue should be received no later than January 1 for consideration.

Other article topics needed during 1982 include: business hardware, computer art and graphics, business hardware, software and unique applications, computer languages, computerized communications and data bases, medical and educational applications, word processors, peripherals and interfacing products, tutorials and utility programs. Special emphasis is placed on business systems and applications.

The payment rate ranges from $20 -$50 per published page. Submittals should include an abstract, outline and stamped return envelope.

Manuscripts should be typed, double spaced with one-inch margins. Minimum length is four pages, unless programs are included. Photos should be numbered and have a brief description attached. Tables, listings, etc. should be on separate pages and each should have a caption. Computer listings should be printed using a new ribbon to assure good reproduction. Authors are requested to submit a statement of their background and expertise.

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A new format has been established for the Micro-Market section. All ads are now 2 inches wide by 3 inches deep. Price is $320 on a 1x rate. Submit ads with check or money order to:

INTERFACE AGE Magazine
Micro-Market Ads
P.O. Box 1234
Cerritos, CA 90701
(213) 926-9544

50¢ TRS-80*

Cassette Duplication

1000 Qty. Minimum

Guaranteed to Load

MICROSETTE CO.
475 Ellis St., Mt. View, CA 94043 (415) 962-0220

*Trademark of Tandy Corp.

CIRCLE INQUIRY NO. 131

ZEMBL — N.0

ZEMBL — N.0 is an initial release of a Z-80 Editor/Monitor/assembler hosted by North Star HORIZON-2-32K-DD under NS DOS-5.2.

Editor allows change/insert/delete source code, and review/change object code.

Monitor renumbers lines, dumps HEX/ASCII, global finds HEX or ASCII strings, jumps to a lable or next open code line.

Short programs are assembled in RAM. Short source code blocks are read from disk, linked, assembled, and written back on disk to maximizing the program length that can be assembled in 32K.

Price: $49/HRZ-DD disk with OP-SPEC.
$ 1/OP-SPEC only.
CA residents add 6% Sales Tax.

Mail check or Money Order to:

ComMarket West
29 W. Palm Ln. Dr.,
Redlands, CA 92373

CIRCLE INQUIRY NO. 128

ENGINEERING ANALYSIS SOFTWARE

Box 1059
Highstown, N.J. 08520
(201) 367-5735

Critical Path (CPM) Project Control computes network start/stop dates with float prints cost and project status evaluation report & network gantt chart — 500 node capacity TRS-80 (I, II, & III) & North Star $300.00

Tube Bending — fabrication data for bent tube shapes input bend radius and node coordinates computes tube cut length, bend and plane angles, segment lengths and mandrel stop setting required for bending machines — TRS-80 (I, II, & III) & North Star $125.00

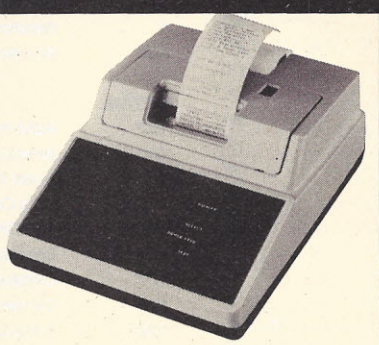
Linear Programming — computes max/min cost functions equations are entered using free-form input TRS-80 (I, II, & III) & North Star $60.00

Custom applications of this program to compute feed mixes, ice cream blends, meat mixtures, etc. are available. call for quote.

Other Engineering Programs including MC2 Software:

Space Frame Structural Analysis
HVAC Load Computations
Fire Sprinkler Design
Hardy Cross Water System Analysis
Sheet Metal Estimating

CIRCLE INQUIRY NO. 135



Dot Matrix Printer Interfaces with Apple II
Featuring an Apple II®-compatible parallel interface, Addmaster Corporation has produced a new dot matrix printer, Model 170. The interface includes a Centronics-type handshake and DB-25 interface connector, Baudot, and day — and time clock. The Model 170 provides 18 or 21 characters per line, 6 lines per inch print density, on standard 2½" adding machine tape. Designed to use with personal computers, Model 170 will produce hard and carbonless copies of programs, data or results. **Write Addmaster Corporation, 416 Junipero Serra Dr., San Gabriel, CA 91776 or call 213/285-1121.**

CIRCLE INQUIRY NO. 126

FLOPPY DISK REPAIRS

★ THREE DAY TURNAROUND AVERAGE ★

PERSCI ★ SHUGART ★ MICRPOLIS
QUME ★ PERTEC ★ TANDON
SEMENS ★ CDC ★ MPI
AND OTHERS
SINGLE AND DOUBLE SIDED
CUSTOMER INTERFACE MODIFICATIONS

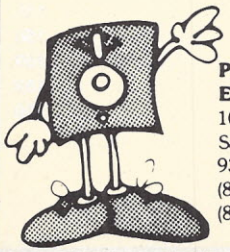
COMPUTER SERVICE CENTER
1023 NO. LA BREA
HOLLYWOOD, CALIF. 90038
213-851-2226

CIRCLE INQUIRY NO. 136

MEMOREX
FLEXIBLE DISCS

WE WILL NOT BE UNDER-SOLD!! Call Free **(800)235-4137** for prices and information. Dealer inquiries invited and C.O.D.'s accepted.

VISA



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo,CA 93401. In CaL call (800)592-5935 or (805)543-1037

CIRCLE INQUIRY NO. 132

CAN YOU KEEP A SECRET?
PrivateLine Can!

PrivateLine turns the inexpensive Radio Shack Color Computer with modem into a secure communications terminal. Talk to any similarly equipped Color Computer in absolute security using your own 8 character key. Change keys as often as you like.

PrivateLine uses an advanced encryption algorithm with billions of different combinations to ensure secure communications. The information typed in at one computer appears on the screen of the other computer — in between it is scrambled beyond recognition.

PrivateLine comes in a convenient plug in ROM Cartridge and works with any size Color Computer and full duplex modem, such as the Radio Shack direct connect modem.

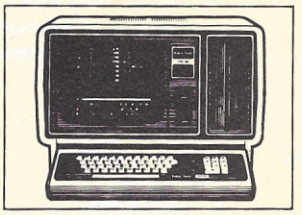
PrivateLine is priced at $99.00 or 2/$189.00
Send check or money order to:

Eigen Systems

P.O. Box 10234
Austin, Texas 78766
(512) 837-4665

CIRCLE INQUIRY NO. 129

Save On TRS-80™ Computers



For the best deals on TRS-80 Computers, we have **SPECIAL DISCOUNTS, FREE SHIPPING** and a **TOLL FREE ORDER NUMBER.**

Pan American Electronics

Dept. 52 • 1117 Conway • Mission, TX 78572
Telex Number 767339
Toll Free Order Number 800/531-7466
Texas & Principal Number 512/581-2766
TM - Trademark of Tandy Corporation

CIRCLE INQUIRY NO. 133

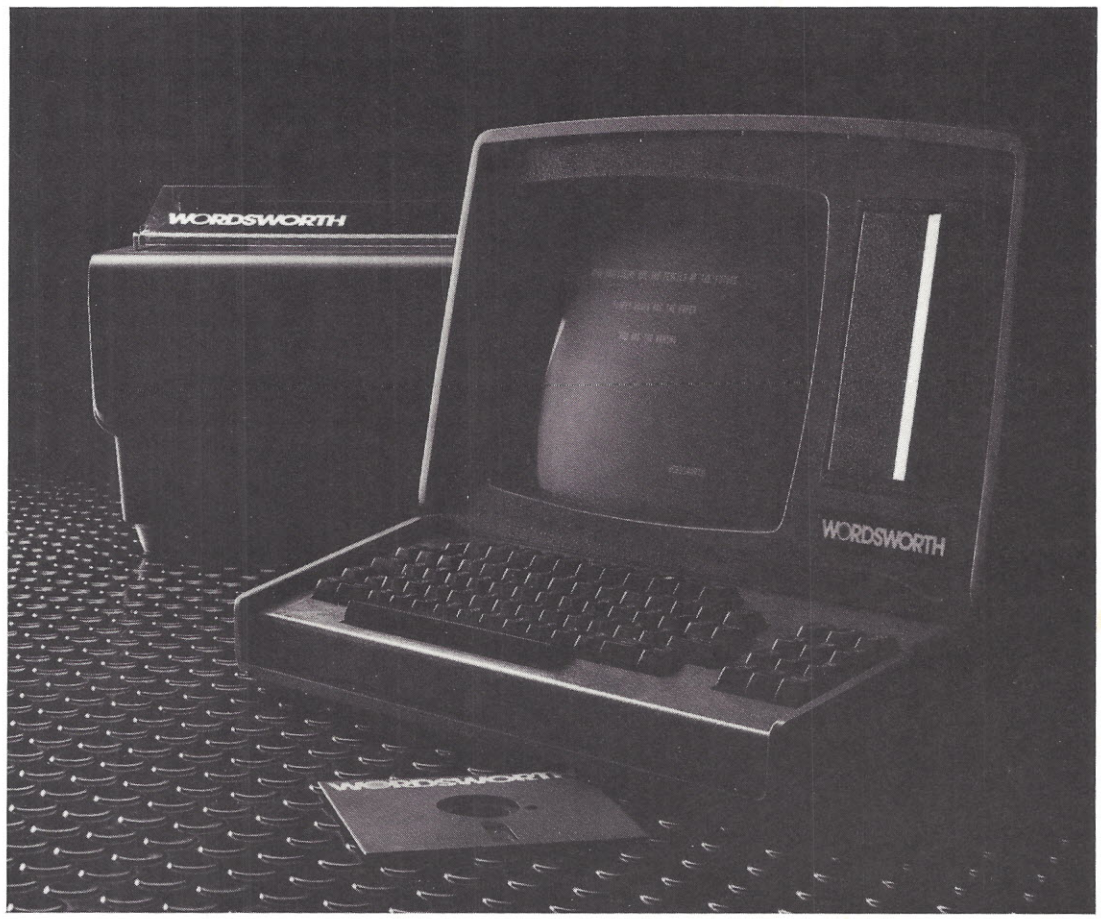
ADVERTISER INDEX

See Reader Service Card between pages 128 & 129

*Manufacturer requests factory direct inquiry.

WE'D LIKE TO THANK THE FOLLOWING PEOPLE:

UNIVAC
IBM
WANG
Digital Equipment Corp.
Xerox
Honeywell



Bless them all. For they were the pioneers.

They were the guys who started with a computer the size of a house, and managed to scrunch it down to the size of a typewriter.

And now, along comes Wordsworth™ and makes it as easy to use as a typewriter.

It's almost embarrassing.

Because all we've really done is distill a lot of great ideas, from a lot of great companies, into one great, low-cost, small space, letter-quality word processor.

With the world's simplest software programs that tell you, right on the screen, how to do all sorts of not-so-simple stuff.

With very little training (a simple "short course" owner's manual), and with very little exaggeration, you can make Wordsworth do anything that a heavy-duty IBM or Wang system can do. In a fraction of the space, at a fraction of the cost. (Within a half hour after you plug it in, you can be turning things out—from typing form letters, to generating accounting reports.)

One more thing. After you've read that brief manual, we back you with a service unique in the industry: "Call Wordsworth." Instant answers to any questions you ever have about how to use Wordsworth. Call toll-free, no fee, and we'll talk you through it, walk you through it, step by step.

So at last, after some of the world's biggest companies developed some of the world's most advanced technology...

Life can be simple.

For the name of your nearest dealer, call toll-free ***1-800-343-6833.*** *In Massachusetts, call collect* ***(617) 828-8150.***

Dealers: For more information about Wordsworth, and immediate delivery from the Leading Edge Inventory Bank™ on some of the industry's most popular computer products, just give us a call.

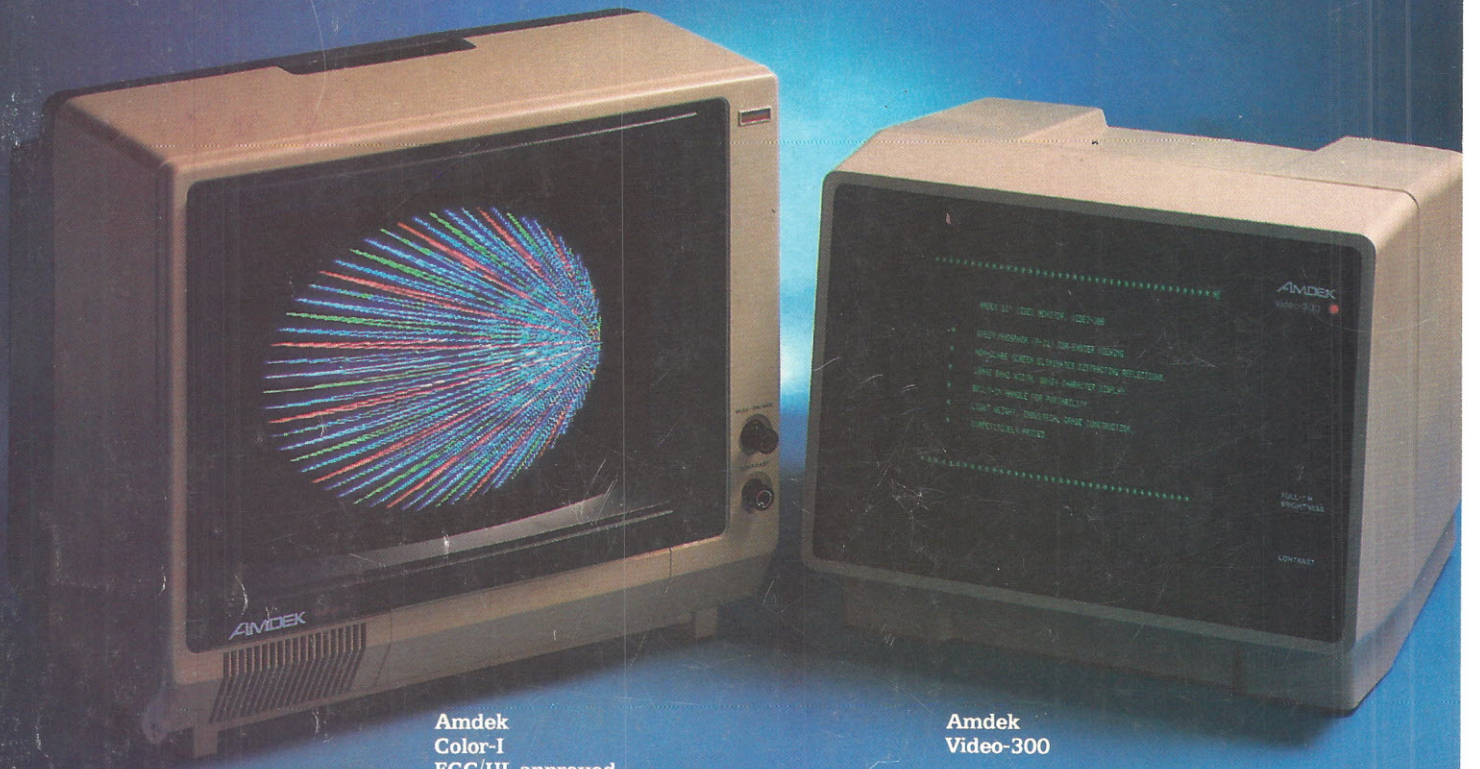
LEADING EDGE.™

Leading Edge Products, Inc.
225 Turnpike Street
Canton, Massachusetts 02021
Telex 951-624

CIRCLE INQUIRY NO. 60

Amdek

From picture perfect.
To letter perfect.



Amdek
Color-I
FCC/UL approved

Amdek
Video-300

At Amdek, we make monitors for people who demand state-of-the-art color. And for people who know that crisp, clear text display is an art in itself.

Our versatile **Color-I** 13″ video monitor features standard NTSC composite input, front-mounted controls and a built-in speaker with audio circuit. Our popular **Video-300** 12″ Green Phosphor monitor has an easy-to-read, non-glare screen, 18 MHZ band width and 80 x 24 character display.

Both offer easy portability, with lightweight cabinetry and molded-in handles. And both are fully compatible with most computer and word processing systems. So compare our performance with other monitors. Then compare prices. For quality and value, you'll choose Amdek.

NEW THIS FALL: our advanced high resolution **Color-II** monitor with interface board for Apple II compatibility. **Color-II** features RGB, TTL input and 560(H) x 260(V) resolution for crisp 80 x 24 character display and exceptionally sharp color graphics. Ask your dealer about an Amdek **Color-II, Color-I,** or **Video-300** monitor today.

AMDEK

2420 E. Oakton Street, Suite "E," Arlington Heights, Illinois 60005 (312) 364-1180 TLX: 25-4786

CIRCLE INQUIRY NO. 9

Come see our comple[illegible]of color, green phosphor and black/whi[illegible]t the COMDEX Show (Booth 386-8[illegible]s, November 19-21.